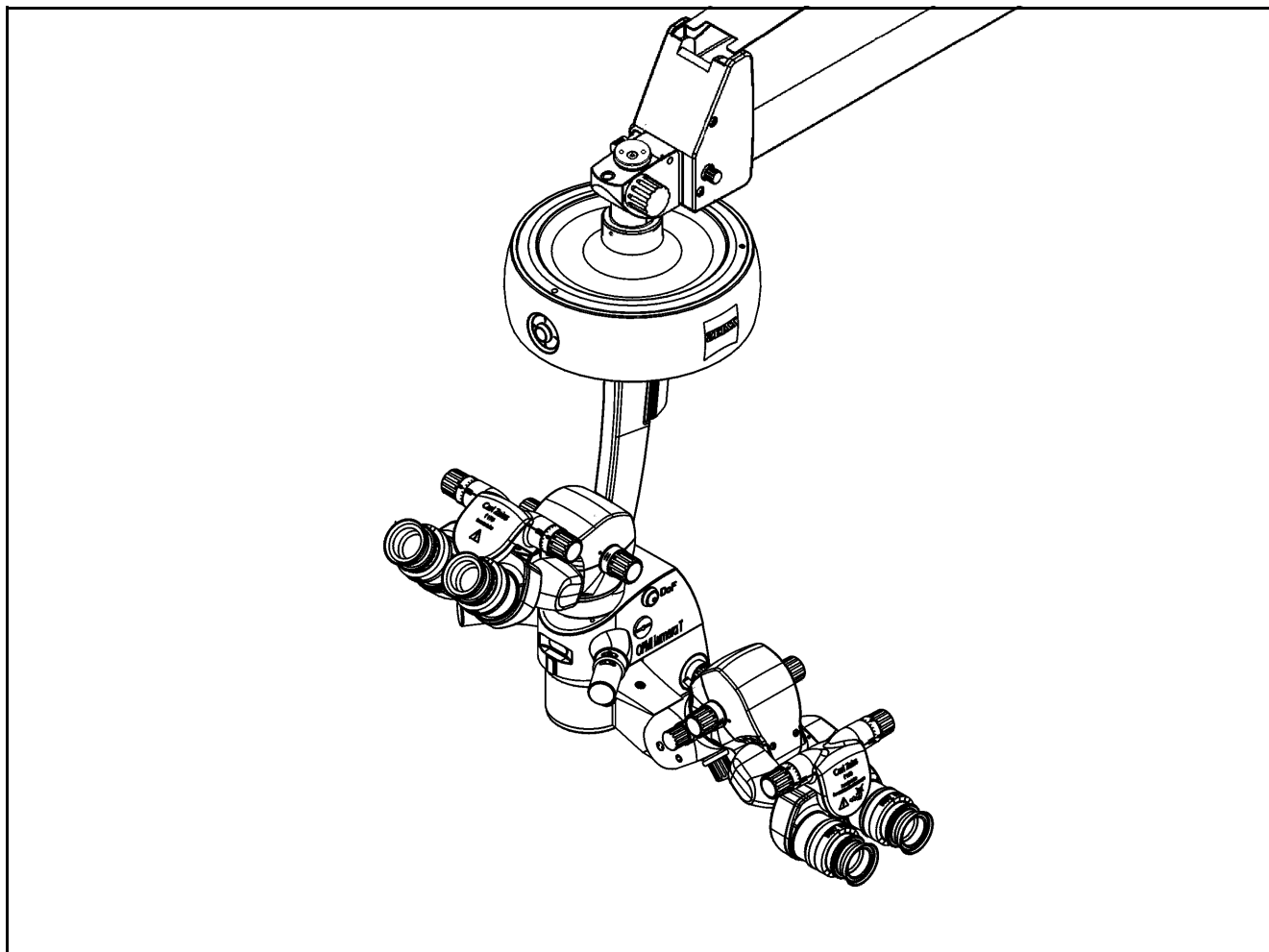


OPMI Lumera® T with Integrated Assistant's Microscope



Instructions for use

G-30-1682-en

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Key to symbols

Different symbols used in this manual draw your attention to safety aspects and useful tips. These symbols are explained in the following.

**Warning!**

The **warning triangle** indicates potential sources of danger which may constitute a risk of injury for the user or a health hazard.

**Caution:**

The **square** indicates situations which may lead to malfunction, defects, collision or damage of the system.

Note:

The **hand** indicates hints on the use of the system or other tips for the user.

OPMI®, **Lumera®**, **Superlux®**, **Invertertube®** and **HaMode®** are registered trademarks of Carl Zeiss Surgical GmbH.

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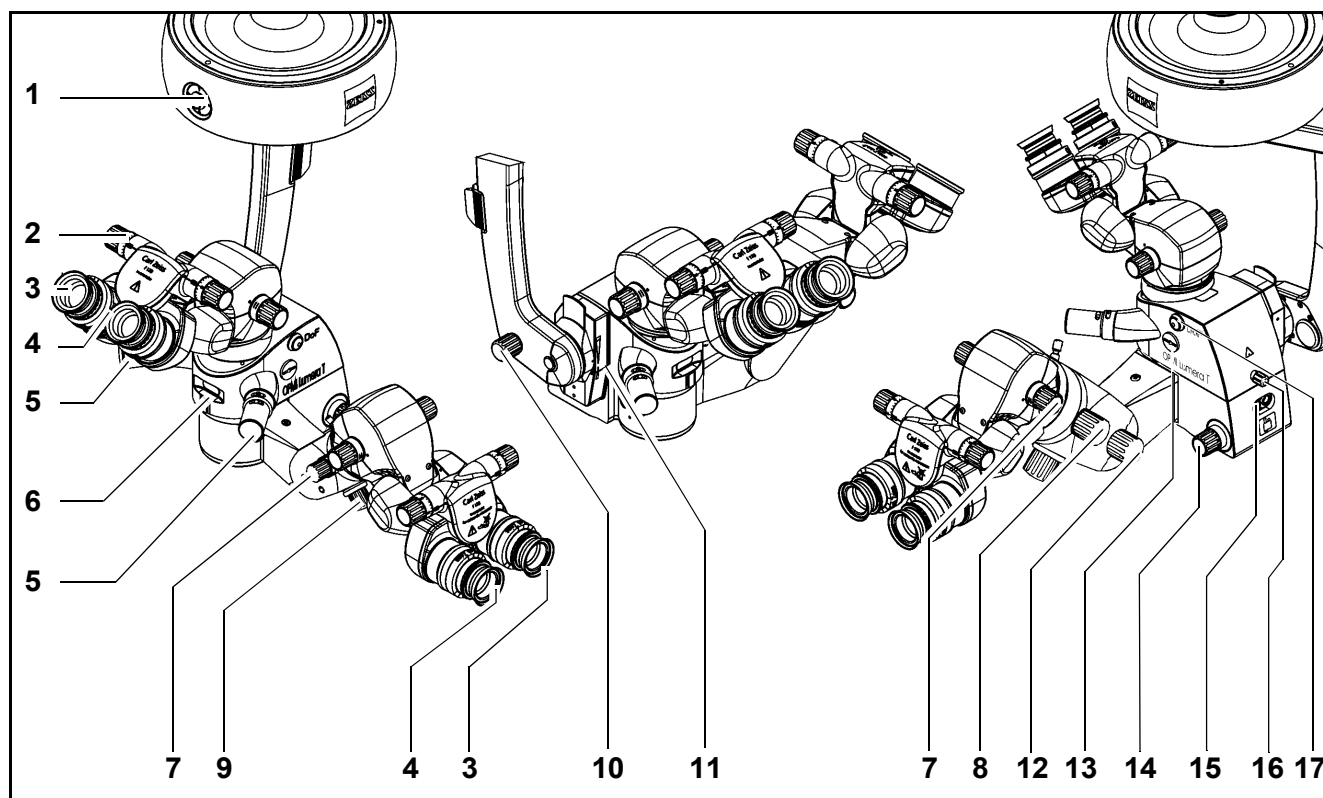
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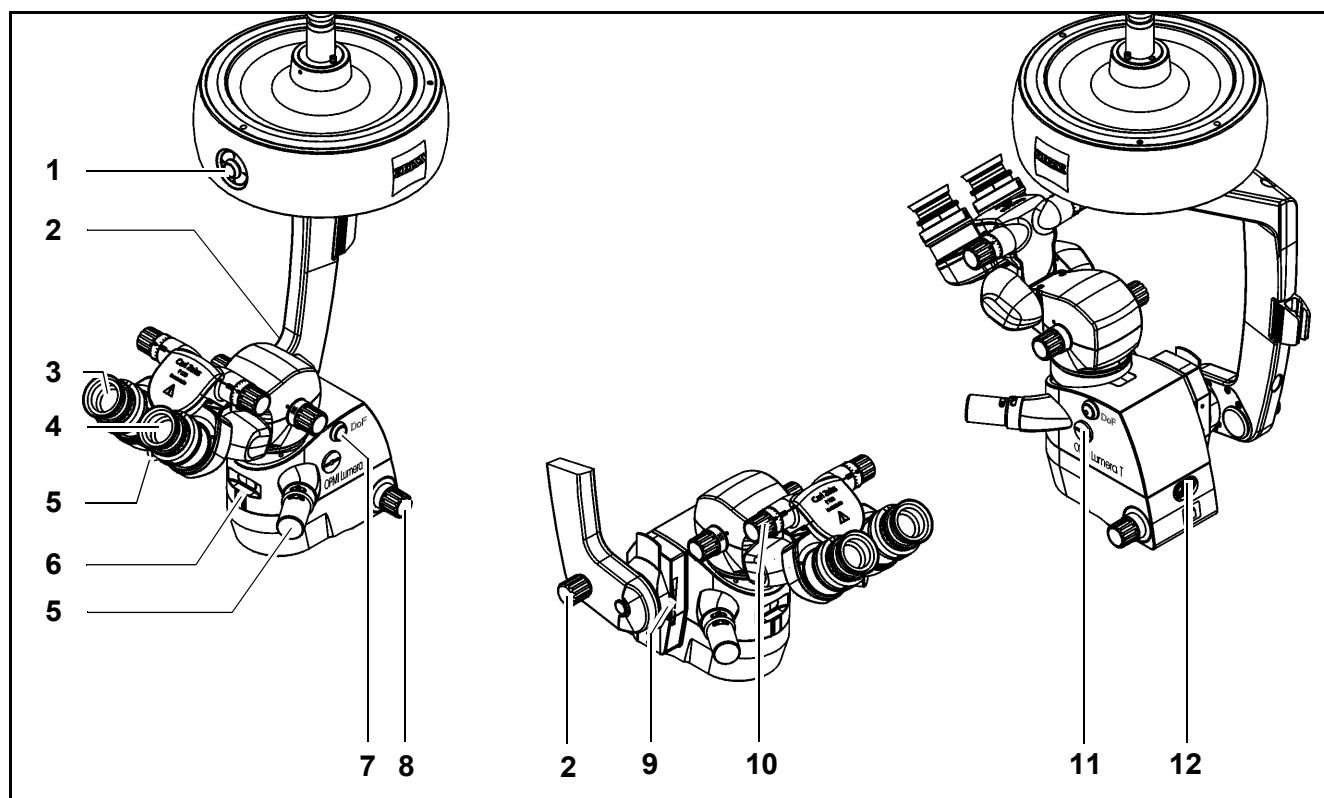
OPMI Lumera T with integrated assistant's microscope

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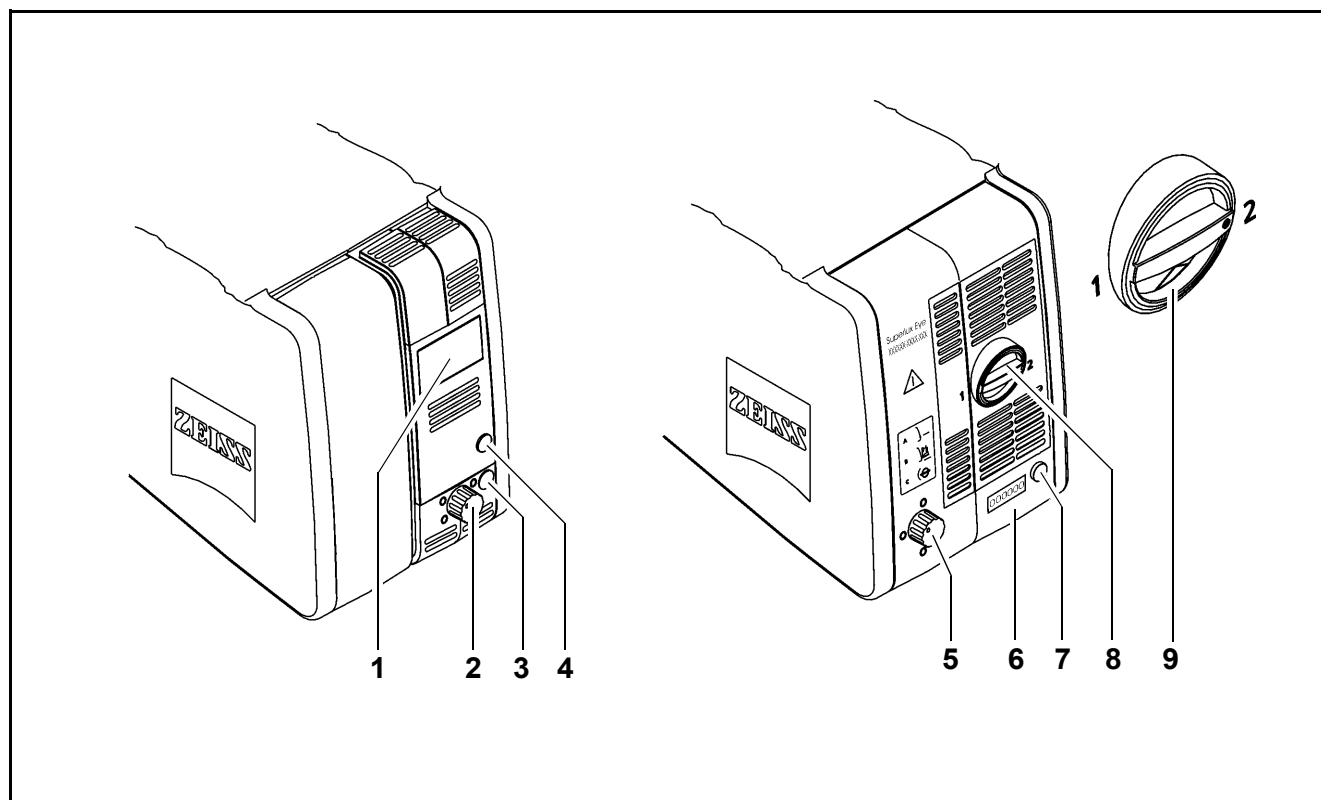
Light sources

Halogen light source

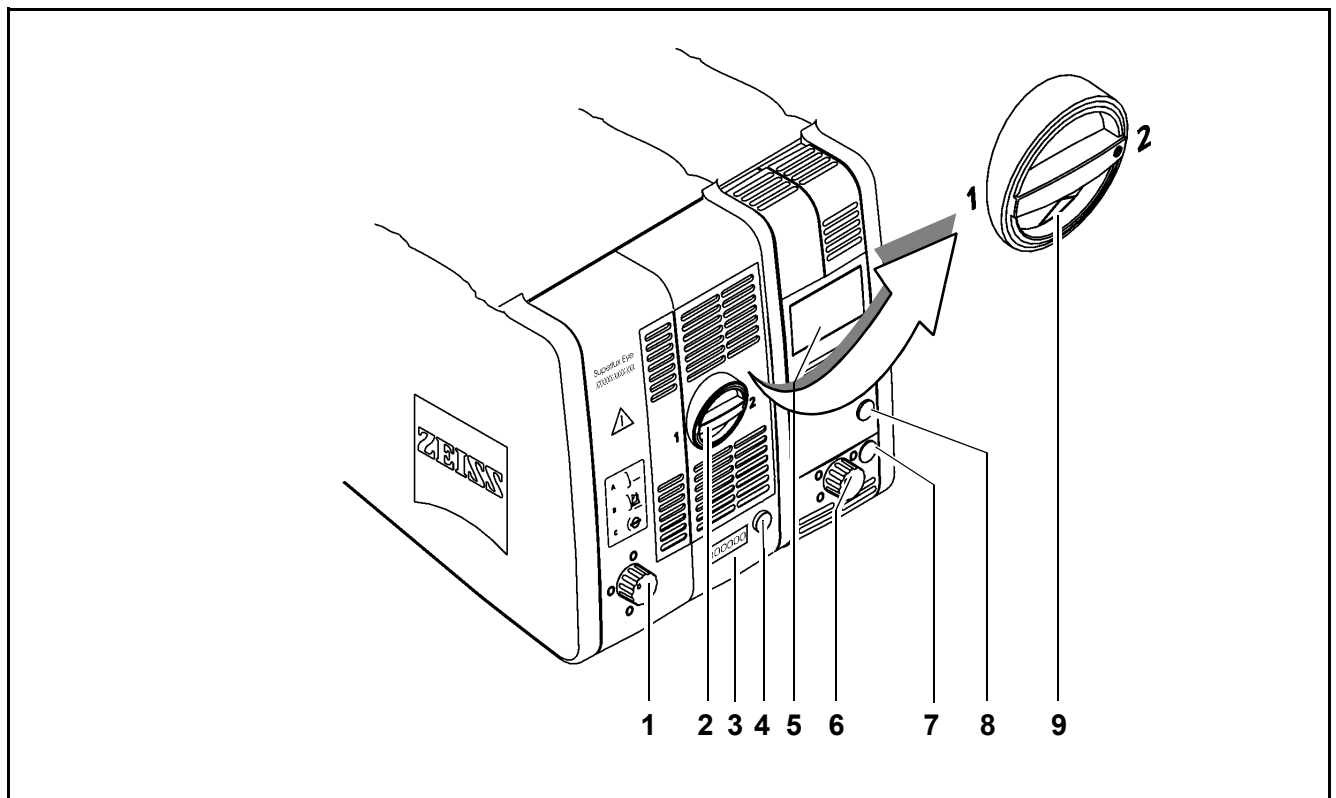
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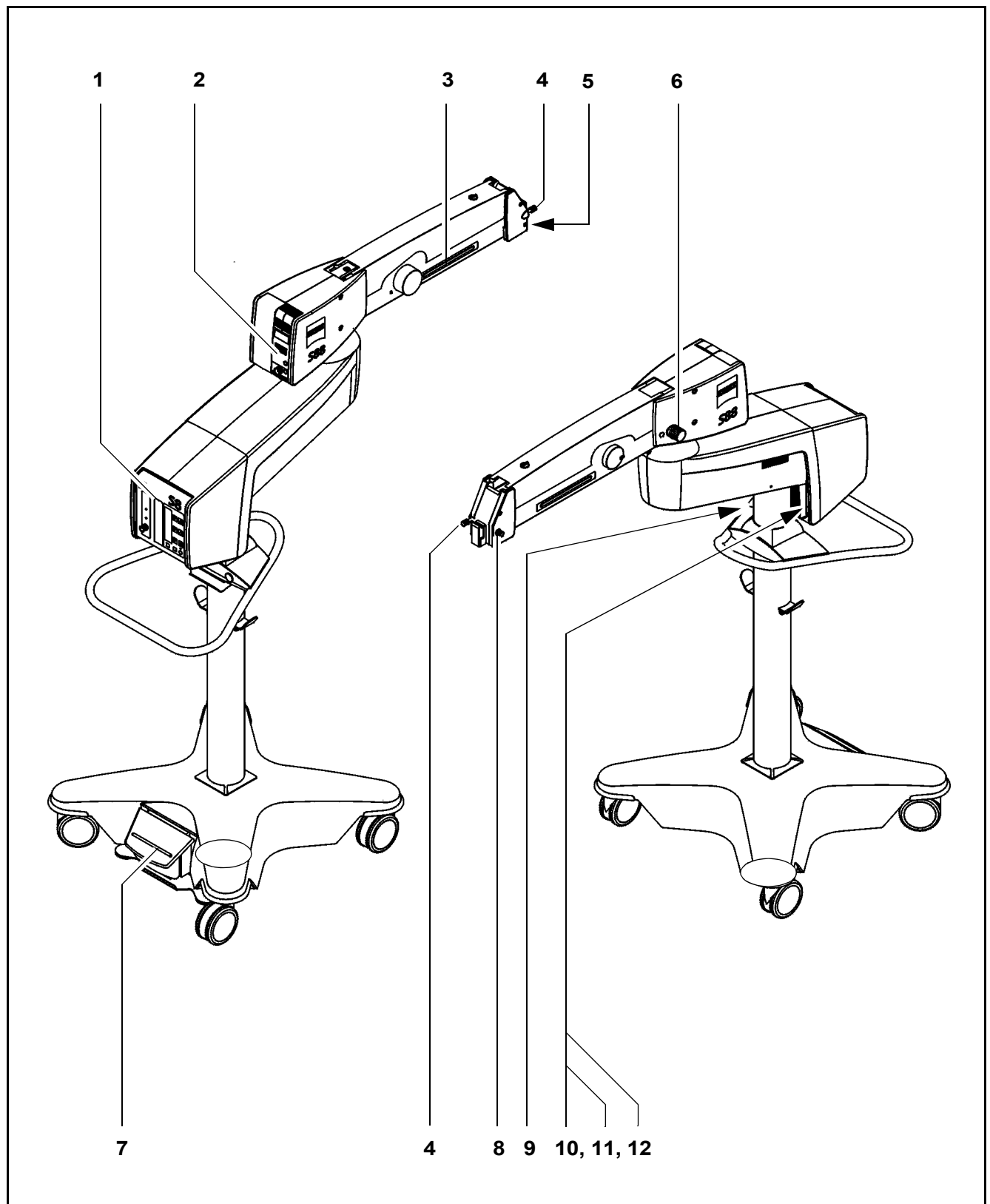


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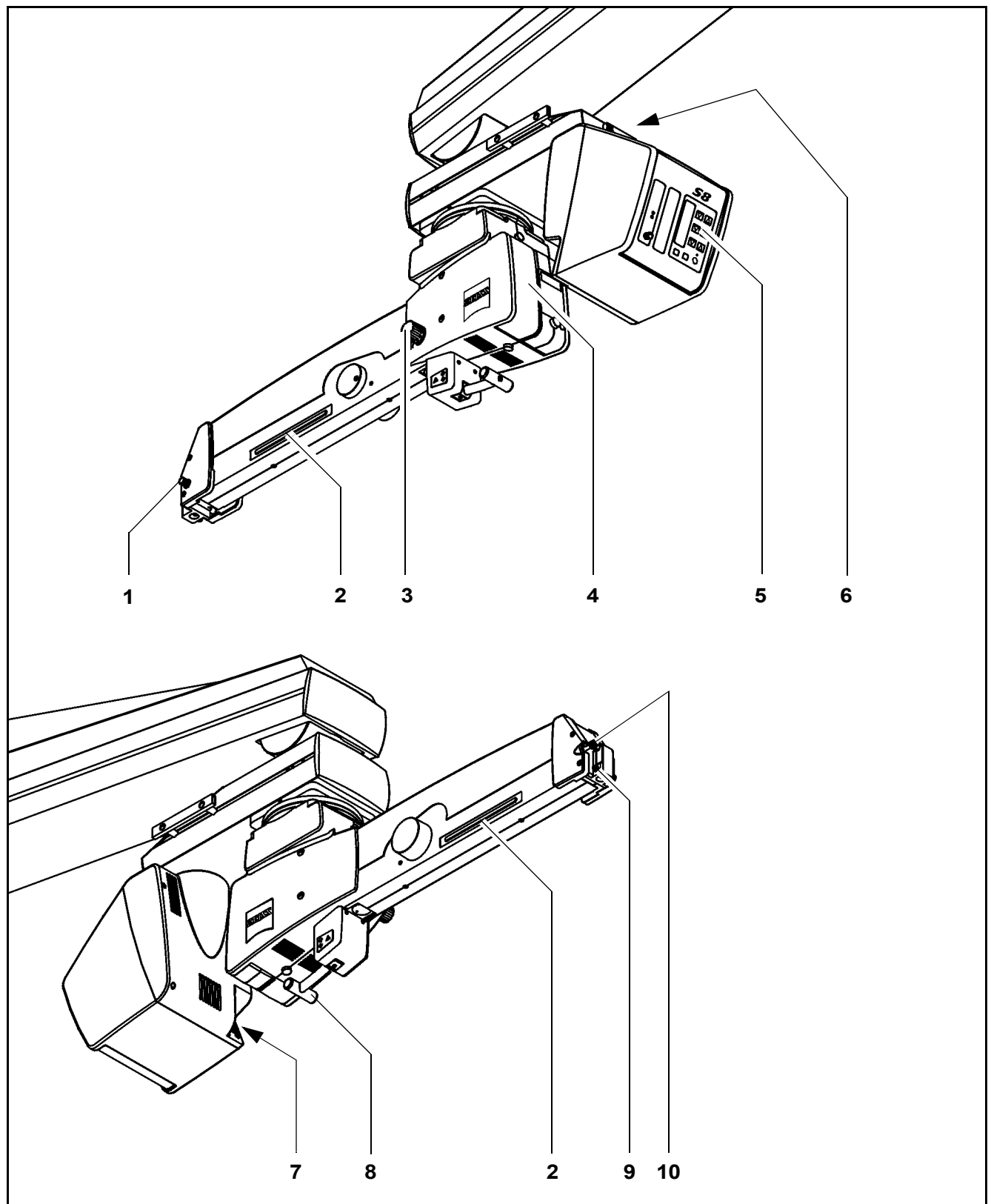
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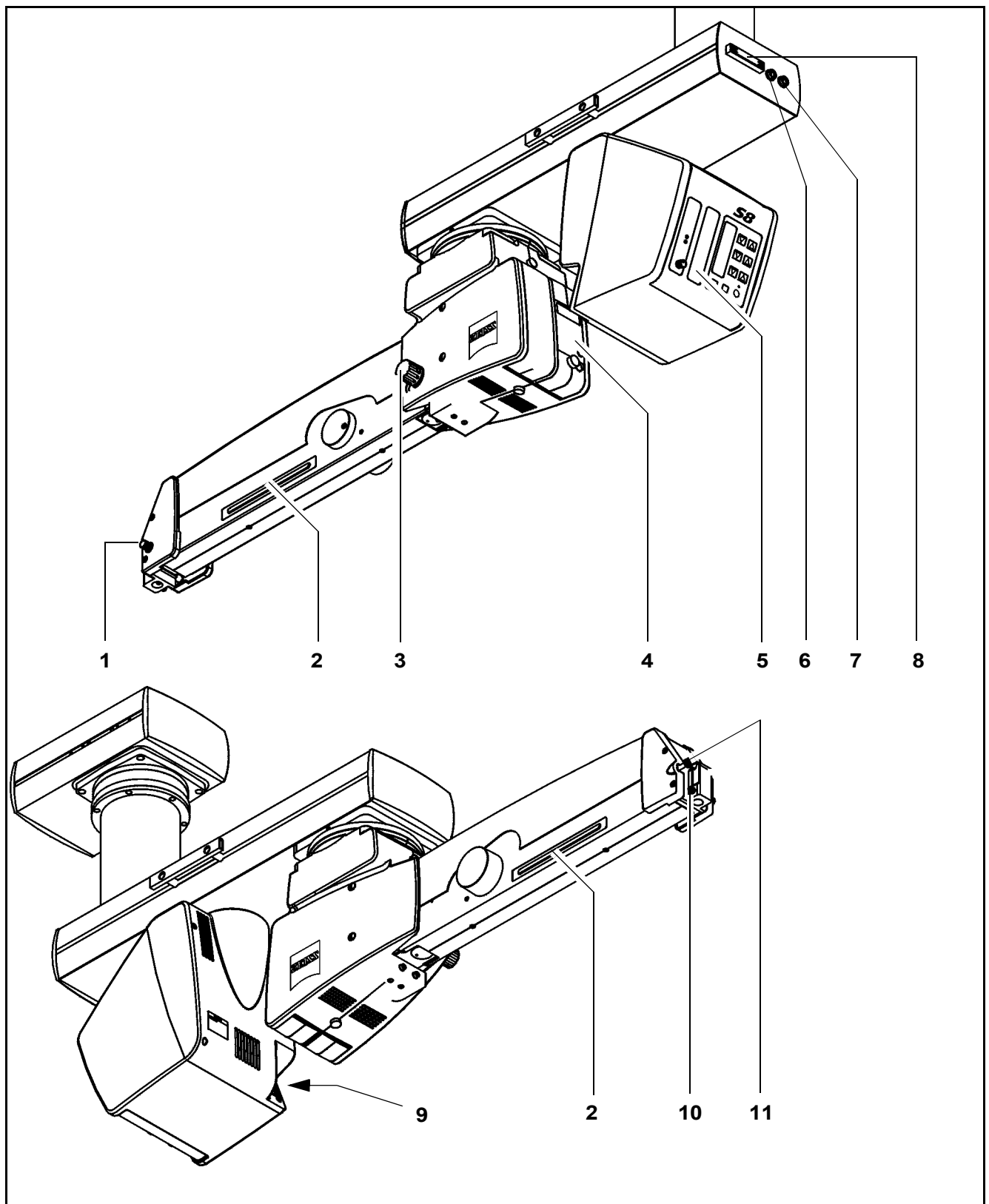
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The device described in this manual has been designed and tested in accordance with Carl Zeiss safety standards as well as German and international standards. This guarantees a high degree of instrument safety.

The system described in this user manual has been designed in compliance with the requirements of:

- EN – IEC – UL – CSA

In accordance with Directive 93/42/EEC for medical devices, the complete quality management system of the company Carl Zeiss Surgical GmbH, 73446 Oberkochen, Germany, has been certified by DQS Deutsche Gesellschaft zur Zertifizierung von Managementsystemen GmbH, a notified body, under registration number 250758 MP23.

- As per Directive 93/42/EEC, the unit is a Class I instrument.
- For USA: FDA classification Class I.



We would like to provide you with information about safety aspects which must be observed when handling this device. This chapter contains a summary of the most important information concerning matters relevant to instrument safety.

Important safety information has been incorporated in this manual and is marked with a warning triangle accordingly. Please give this information your special attention.

The correct use of the system is absolutely vital for safe operation. Please make yourself totally familiar with the contents of this manual prior to start-up of the instrument. Please also observe the user manuals of any additional equipment. Further information is available from our service department or from authorized representatives.

- Please observe all applicable accident prevention regulations.
- The instrument must be connected to a special emergency backup line supply in accordance with the regulations or directives which apply in your country.

Notes on installation and use

Safe working order

- Do not operate the equipment contained in the delivery package in
 - explosion-risk areas,
 - the presence of inflammable anesthetics or volatile solvents such as alcohol, benzine or similar chemicals.
- Do not station or use the instrument in damp rooms. Do not expose the instrument to water splashes, dripping water or sprayed water.
- Switch off the unit at the power switch if you notice any smoke, sparks or unusual noise. Do not use the unit until it has been repaired by our service team.
- Do not place any fluid-filled containers on top of the instrument. Make sure that no fluids can seep into the instrument.
- Do not force cable connections. If the male and female parts do not readily connect, make sure that they are appropriate for one another. If any of the connectors are damaged, have our service representative repair them.
- Potential equalization: If requested, the instrument can be incorporated into potential equalization measures.
- Do not use a mobile phone in the vicinity of the equipment because the radio interference can cause the equipment to malfunction. The effects of radio interference on medical equipment depend on a number of various factors and are therefore entirely unforeseeable.
- Modifications and repairs on these instruments or instruments used with them may only be performed by our service representative or by other authorized persons.
- The manufacturer will not accept any liability for damage caused by unauthorized persons tampering with the instrument; this will also forfeit any rights to claim under warranty.
- Over longer distances (e.g. removal, return for repair, etc), the instrument may only be transported in the original packaging or in special return packaging. Please contact your dealer or the Carl Zeiss service team.
- Use this instrument only for the applications described.

- Only use the instrument with the accessories supplied. Should you wish to use other accessory equipment, make sure that Carl Zeiss or the equipment manufacturer has certified that its use will not impair the safety of instrument.
- When mounting accessory equipment, please make sure that the admissible total weight of the surgical microscope is not exceeded. (See label or chapter "Technical data").
- Only personnel who have undergone training and instruction are allowed to use this instrument. It is the responsibility of the customer or institution operating the equipment to train and instruct all staff using the equipment.
- Keep the user's manuals where they are easily accessible at all times for the persons operating the instrument.
- Never look at the sun through the binocular tube, the objective lens or an eyepiece.
- Do not pull at the light guide cable, at the power cord or at other cable connections.

This system is a high-grade technological product. To ensure optimum performance and safe working order, we recommend having it checked by our service representative as part of regular scheduled maintenance. If a failure occurs which you cannot correct with the aid of the chapter "What to do in the event of malfunctions", attach a sign to the system stating it is out of order and contact our service representative.



- Observe the labels showing the symbol "Risk of crushing"!

Notes on EMC (electromagnetic compatibility)

The system meets the EMC requirements of IEC 60601-1-2. During use of the system, the precautionary measures concerning EMC listed below must be observed.

Only use accessories that have been approved by Carl Zeiss for this system.

Do not use any portable or mobile high frequency communication devices in the vicinity of the system, as this may lead to an impairment of its function.

The system complies with the limits for a Class A device concerning radio frequency emission. However, the possibility of interference to high frequency receiving devices (e.g. TV sets or radios) being used in the surroundings cannot be ruled out. If interference of this type occurs, please inform your Carl Zeiss Service.

Requirements for operation

- For ceiling mounts only: Our service staff or a qualified person appointed by us will install the system on ceiling anchors which have been properly mounted by the construction engineers responsible. These ceiling anchors must comply with the specifications contained in our planning manual.
- Our service representative or an expert authorized by us will install the system. Please ensure that the following requirements are met for further operation:
 - All mechanical connections (details in the user's manual) which are relevant to safety are properly connected and screw connections tightened.
 - All cables and plugs are in good working condition.
 - The voltage setting on the instrument conforms to the rated voltage of the line supply on site.
 - The instrument is plugged into a power outlet which has a properly connected protective ground contact.
 - The power cord being used is the one designed for use with this instrument.

Before every use and after re-equipping the instrument

- Make sure that all "Requirements for operation" are fulfilled.
- Go through the checklist.
- Re-attach or close any covers, panels or caps which have been removed or opened.
- Pay special attention to warning symbols on the instrument (triangular warning signs with exclamation marks), labels and any parts such as screws or surfaces painted red.
- Do not cover any ventilation openings.

For every use of the instrumentGeneral

- Never operate the system unattended.
- Excessive radiation exposure times may lead to retinal injury in the patient's eye. Never leave a system unattended when the light source has been activated.

- Avoid looking directly into the light source, e.g. into the microscope objective lens or a light guide.
- When the illumination is on, the light guide must be connected at both ends. Otherwise there is a risk of fire or burn injuries.
- Make sure that the instrument has been switched off before you change the xenon lamp module. When switched on, the ignition system generates high voltage.

Xenon lamps feature high luminance and a spectrum resembling that of natural daylight. Therefore, only special xenon lamps approved by Carl Zeiss must be used in ophthalmology.

- Any kind of radiation has a detrimental effect on biological tissue. This also applies to the light illuminating the surgical field. Please therefore reduce the brightness and duration of illumination on the surgical field to the absolute minimum required.
- Phototoxic effect of light beams. When operating on the eye, always use the yellow protection filter to ensure that the patient's eye is not exposed to unnecessary (blue) radiation (risk of retinal injury).
- Adjust the illumination intensity as required for the type of illumination used and the radiation exposure time. You will find the values recommended by Carl Zeiss in the table "Maximum radiation exposure times" on page 29.

S88 floor stand

- Using the locking pedal on the base, secure the stand in position. Make sure that the stand is stable and cannot roll away.

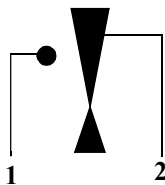
After every use of the instrument

- Always use the main power switch of the instrument to turn it off.
- The main power switch must always be turned off when the instrument is not in use.

When using a wide-angle observation system (e.g. BIOM 3)



Risk of collision!



When using a wide-angle observation system (e.g. BIOM 3 from Oculus) which is usually installed between the surgical microscope and the patient, make sure that the patient is neither put at risk nor injured by the motorized focusing system or the movement of the suspension system arm.

Only use accessories expressly certified by the manufacturer for combination with the surgical microscopes described in this manual.

Warning!

- With the wide-angle observation system swung out of position, always position the microscope body in such a way that index dot (1) of the microscope's focus is in the middle of triangle (2) of the marking.
- Select a medium magnification (e.g. 1.0).
- Lower the surgical microscope toward the surgical field until you see the patient's cornea sharply defined.
- Turn the setting screw for limiting the downward movement clockwise as far as it will go and check without the patient that the suspension arm cannot be lowered any further.

It is vital that you read the user manual for the wide-angle observation system used (e.g. BIOM 3 from Oculus).

Phototoxic retinal injury in eye surgery

General

Several papers¹⁾⁻⁵⁾ dealing with the problem of phototoxicity in ophthalmic surgery have been published. A comprehensive review of these publications reveals five aspects of particular concern:

- Illumination characteristics (spectral composition)
- Illumination intensity
- Angle of illumination
- Focus of the light source
- Exposure time to light

In the following, comments on these aspects are given and a description of how Carl Zeiss, as a manufacturer, makes allowance for them in its systems.

Illumination characteristics (spectral composition)

Studies on the exposure of the eye to light of varying spectral composition date back to the early 1950s. These studies suggest that the potential hazard of phototoxic injury to the patient's retina can be reduced by blocking out the blue and ultraviolet light below a wavelength of 475 nm.

For protection of the retina, Carl Zeiss offers the blue barrier filter (retina protection filter) as a standard feature of the OPMI Lumera surgical microscopes. This reduces not only the exposure of the patient's eye to light, but also that of the surgeon's.

An important point to note here, however, is that the use of filters will inevitably change the perceived color of the light. For this reason, the physician may initially have to get used to the changed appearance of the anatomical structures.

Illumination intensity

The majority of researchers suggest that the surgeon should use the lowest light intensity required at the patient's eye to guarantee good viewing during surgery.

Carl Zeiss has addressed this aspect by providing its systems with a device for continuously varying the brightness of the light source. This permits the surgeon to optimally adapt the light intensity at the patient's eye to the conditions existing in each case.

Angle of illumination

A number of publications¹⁾⁻⁴⁾ suggest that the microscope should be tilted to reduce the exposure of the macula to direct illumination.

Carl Zeiss ophthalmic surgical microscopes are therefore equipped with the following:

- Tilting mechanism for the microscope body
- Surrounding field illumination with brightness control
- Red reflex illumination (stereo coaxial illumination)

Focus of the light source

Studies show that injuries are likely to occur if the filament of the light source is imaged on the patient's retina. The peak intensity of a filament is considerably higher than that of an even and extended light source such as a light guide.

This is the reason why Carl Zeiss uses fiber optic illumination in its surgical microscope systems.

Exposure time to light

According to some publications, the phakic and aphakic eye should not be exposed to the light source longer than a few minutes. In all surgical cases, the retinal exposure time depends on the type and duration of the procedure and possible case complications. It is therefore recommended in ophthalmic surgery to keep the light intensity as low as possible, or to use a device which prevents the light from entering through the patient's pupil. It is also recommended to make sure that the patient's eye is not additionally exposed to the light of surrounding light sources. This problem has been solved by Carl Zeiss by the use of a retinal protection device that can be swung into the microscope's illumination beam path and a blue barrier filter (retina protection filter).

Brightness control

The brightness control scale of our systems has a linear structure with values ranging from 0.5 to 10. The stipulations of standard ISO/FDIS 15004-2:2006(E) result in maximum radiation exposure times for the different illumination configurations as specified in the table "Maximum radiation exposure times".

The microscope light source - like any bright light source - may present a hazard to the patient's eye both in the form of immediately visible thermal damage to the retina as well as phototoxic chemical reactions which may lead to photoreinitis. The factors which play an important role in determining the phototoxic risk are:

- Lamp brightness.
- Spectral distribution of the light (UV and blue are more dangerous than longer wavelengths).
- Duration of direct exposure.
- Pupil size.
- Clarity of ocular media (infants and young children, for example, may be at a higher risk).

- Phakic status of the eye (aphakic and pseudo-aphakic eyes without UV and blue filtering IOLs are at a higher risk).
- Previous exposure to bright light such as retinal photography, especially within the last 24 hrs.

The following table is intended to provide the surgeon with a guideline in determining the potential hazard. The data has been calculated for a worst-case scenario of direct, uninterrupted exposure of an aphakic eye with an 8 mm dilated pupil. The calculations are based on the recommended occupational health daily exposure limits as defined in ⁶⁾. A safety factor of 10 has been used in determining these limits.

During cataract procedures, factors such as lenticular material, instruments such as the phaco handpiece, and movement of the eye provide interruption of the exposure and would be expected to significantly lengthen the time before photoretinitis might be expected to occur.

A prospective study ⁷⁾ of the effects of microscope illumination during surgery did not reveal any phototoxic retinal injuries for procedure times of up to 30 minutes if the calculated maximum recommended exposure time was 150 seconds. However, it was also found that at the same brightness setting, phototoxic retinal injury could be expected after approximately 100 min.

The red reflex illumination (stereo coaxial illumination) of OPMI Lumera has been designed to provide a bright red reflex using only very small quantities of light at the center of the light spot. The peripheral field illumination causes higher exposure of the retina, but usually not directly of the macula, depending on the position of the eye. For cataract procedures, we recommend adjusting the surrounding field illumination to be somewhat darker than the central red reflex spot. Not only does this setting minimize phototoxic risk, but it also reduces glare from the patient's sclera.

Other recommendations for minimizing phototoxic risk are:

- Always use the lowest possible brightness setting.
- Use the blue barrier filter (retina protection filter) to block the blue spectrum of light. The blue barrier filter will increase the recommended exposure times by factor three.
- When working on the exterior eye, use the retinal protection device to prevent light from entering the pupil, especially when the pupil is dilated.
- Turn off the microscope illumination system or cover the patient's eye during pauses in surgery.

Maximum radiation exposure times

The use of the blue barrier filter (retina protection filter) increases the recommended exposure time by a factor of 3 compared with the values specified below.

Red reflex illumination (stereo coaxial illumination)

Scale display of Illumination	Max. exposure time in minutes		
	Halogen	Xenon	Xenon with HaMode filter
2.5	50	8.2	28
5	21	4.2	16.5
7.5	13	2.9	10.3
10	9	2.2	8.5

Surrounding field illumination

Scale display of Illumination	Max. exposure time in minutes		
	Halogen	Xenon	Xenon with HaMode filter
2.5	8.7	2.5	8.9
5	3.7	1.3	5.2
7.5	2.2	0.9	3.3
10	1.6	0.7	2.7



Note:

The illumination system of the surgical microscope contains a UV blocking filter as a standard feature.

This helps the surgeon to reduce the risk of phototoxic retinal injury in the patient.

List of references

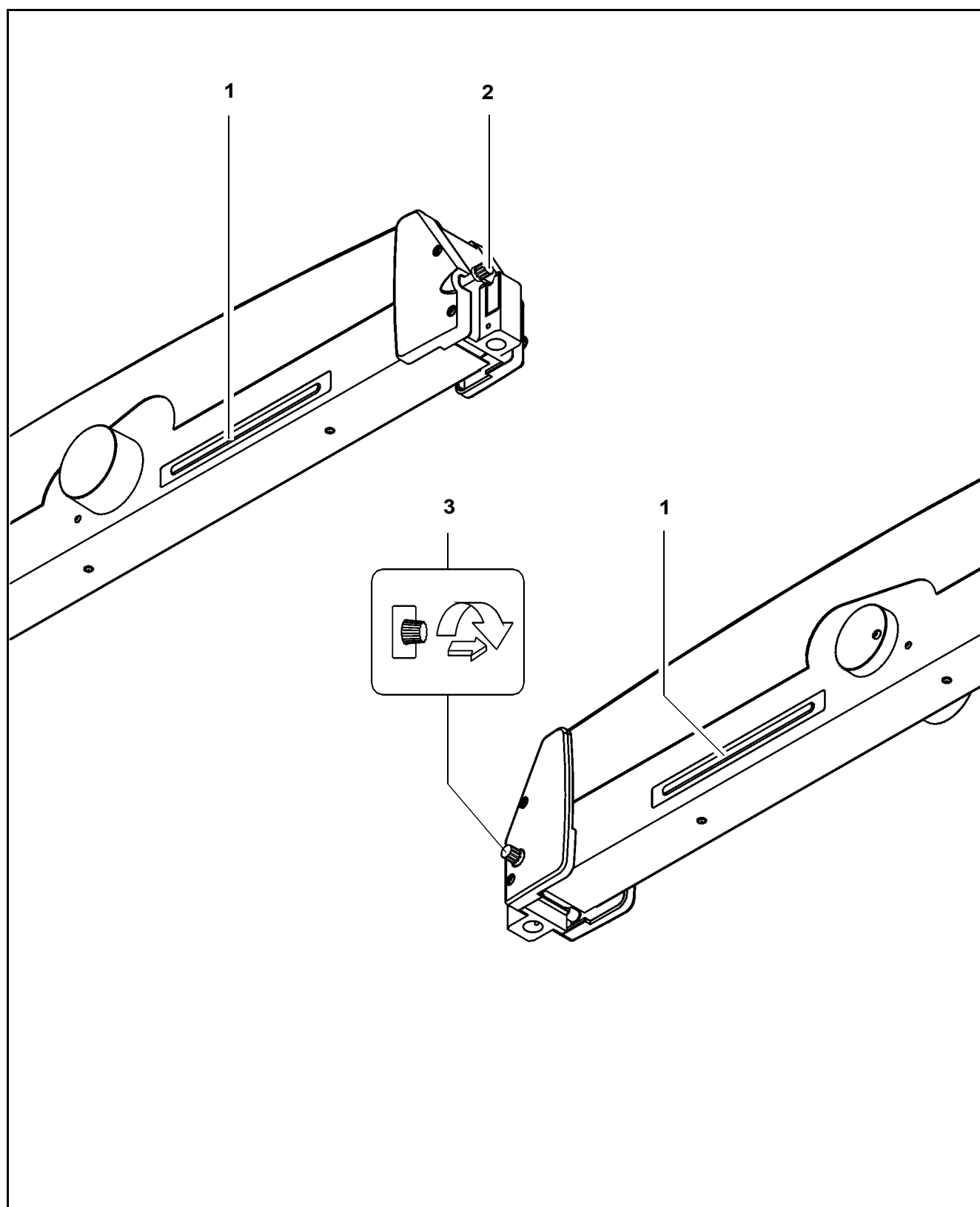
- ¹⁾ H. Stiller, and B. Rassow, "Light hazards to the patient's retina from ophthalmic instruments," Applied Optics-OT 30, 2187-2196 (1991).
- ²⁾ American Conference of Governmental Industrial Hygienists, "Documentation of the Threshold Limit Values for physical agents. 7th Edition," (American Conference of Governmental Industrial Hygienists, Cincinnati, 2001).
- ³⁾ S. G. Khwarg, F. A. Linstone, S. A. Daniels, S. J. Isenberg, T. A. Hanscom, M. Geoghegan, and B. R. Straatsma, "Incidence, risk factors, and morphology in operating microscope light retinopathy," Am. J. Ophthalmol. 103, 255-263 (1987).

- 4) G. Kleinmann, P. Hoffman, E. Schechtman, and A. Pollack, "Microscope-induced retinal phototoxicity in cataract surgery of short duration," *Ophthalmology* 109, 334-338 (2002).
- 5) ISO/FDIS 15004-2:2006(E) Optical instruments -- Fundamental requirements and test methods -- Part 2: Light hazard protection
- 6) David Sliney, Danielle Aron-Rosa, Francois DeLori, Franz Fankhauser, Robert Landry, Martin Mainster, John Marshall, Bernard Rassow, Bruce Stuck, Stephen Trokel, Teresa Motz West, and Michael Wolffe, Adjustment of guidelines for exposure of the eye to optical radiation from ocular instruments: statement from a task group of the International Commission on Non-Ionizing Radiation Protection (ICNIRP) *APPLIED OPTICS* Vol. 44, No. 11, p 2162 (10 April 2005)
- 7) Byrnes, G.A., Antoszyk, A.N., Mazur, D.O., Kao, T.C., Miller, S.A., Photic maculopathy after extracapsular cataract surgery. A prospective study, 1992/05/01 *Ophthalmology*, VL - 99, IS - 5, SP - 731, EP - 737, PB - Elsevier



Safety devices of the suspension systems

- 1 Release bar**
Allows non-sterile persons to release the magnetic brakes of the suspension system.
- 2 Adjustment screw for limiting downward movement**
Use this knob to set the minimum vertical working distance from the surgical field. Check this setting before each surgical procedure.
- 3 Locking knob**
for the horizontal position of the suspension arm
Before removing or attaching a module (microscope, tube, etc.) move the suspension arm into its horizontal position. Pull out the locking knob and turn it clockwise or counterclockwise through 180°. At the same time, slightly move the suspension arm up and down until the lock snaps in. This prevents the suspension arm from uncontrollably moving upward when insufficient weight is attached. After mounting the module, unlock the suspension arm and perform the balancing procedure.



Halogen light source

1 Flap

The flap is the mechanical indicator for the operating status of the halogen lamps.

- When the flap is closed, the main lamp is operative.
- When the flap is open, the main lamp has failed. The backup lamp is on.

2 Switching to the backup lamp

The lamp housing contains a backup lamp which is automatically swung into the illumination beam path when the first lamp fails. If this automatic function fails, you can switch on the backup lamp by pressing this button.

3 Filter selector knob

The filter knob has four positions:



no filter



blue barrier filter (retina protection filter): use the blue barrier filter when operating on the eye. It protects the patient's retina against unnecessary (blue) radiation and permits the radiation exposure time to be increased by factor 3.



KK 40 filter:

to increase the color temperature



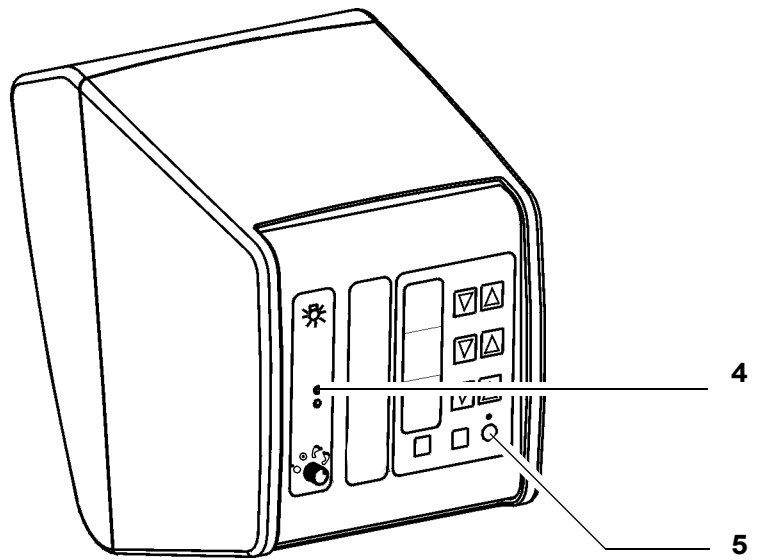
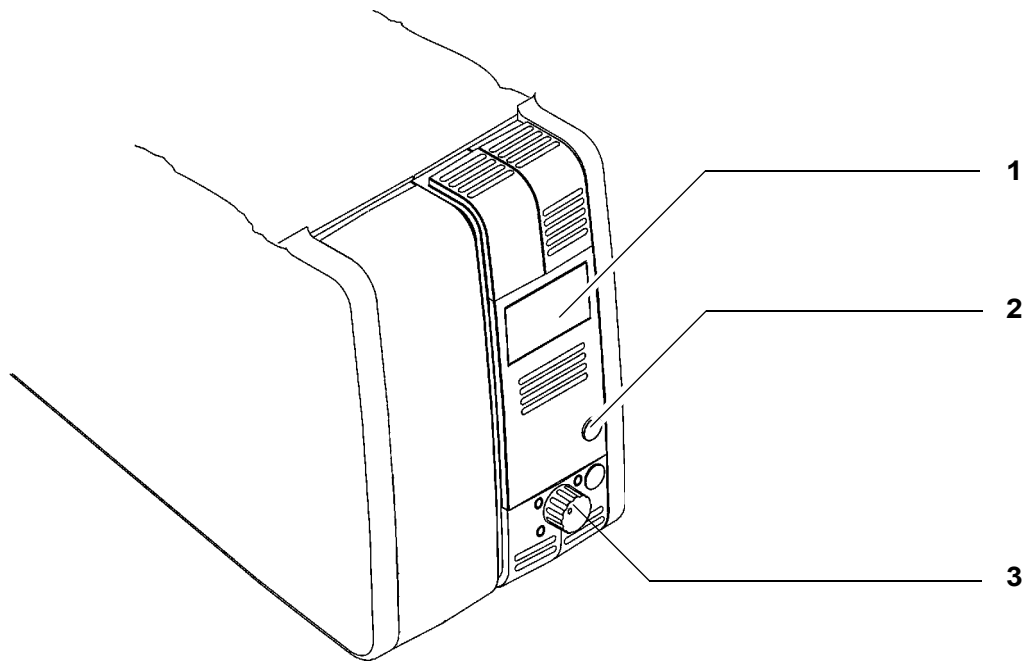
empty filter position

4 Yellow indicator lamp

- Lights when the main lamp has failed. In addition, open flap (1) on the lamp module indicates that the main lamp has failed. The backup lamp is on.
- Blinks when the backup lamp has failed.

5 Manual function

When the manual function has been activated, all electrical control systems are disabled. The lamp brightness is automatically adjusted to a fixed setting.



Superlux Eye light source



Warning!

The xenon lamp has a limited service life of 500 h.

If used beyond its maximum service life, the xenon lamp may explode.

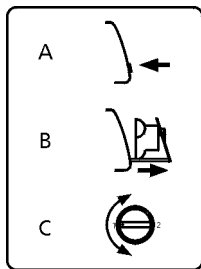
- Replace the xenon lamp in good time.
- Reset the service hour counter to "0" after replacing the lamp.



Warning!

Lamp rupture (audible as a loud bang) may lead to jamming of the lamp module and/or failure of the electronics modules.

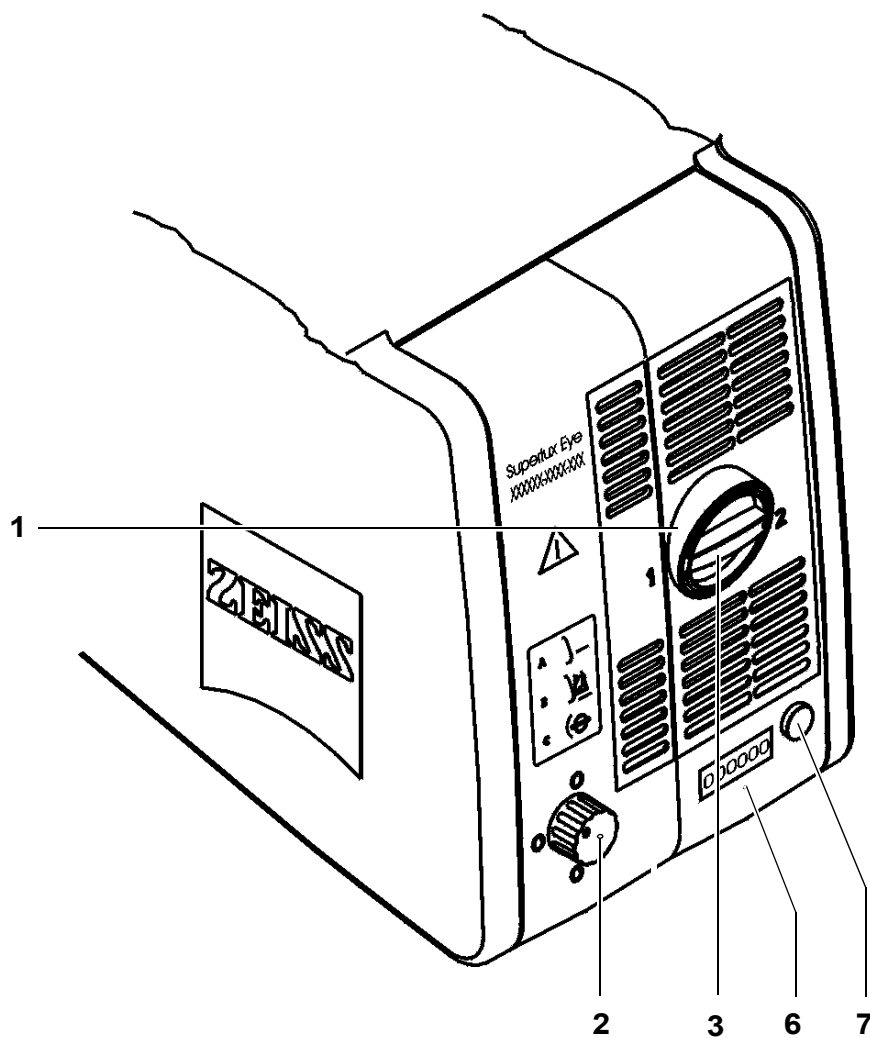
- Before opening the lamp housing, make sure that the system is moved to a position where neither the patient nor the user is put at risk by falling items.
- Do not continue using the system if the lamp module is jammed or the illumination is no longer operational due to defective electronics modules. Inform our service department.



1 Switching to the backup lamp

The lamp module contains two xenon lamps. The second bulb is used as a backup bulb which must be swung into the illumination beam path if the first bulb fails.

- When the xenon lamp fails, open the lamp module as follows: Press button (7). The lamp module is slightly ejected.
- Pull out the lamp module as far as it will go.
- Turn knob (1) through 180° until it snaps in place. This moves the backup lamp into the illumination beam path.
- Push the lamp module all the way back into the lamp housing.
- Reset the service hour counter to "0". Use a pointed object and press it into the recess of reset button (6).



2 Filter selector knob

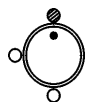
The filter selector knob has the following positions, depending on the light source used:



No filter



Blue barrier filter (retina protection filter)



HaMode filter (standard)

485 nm fluorescence excitation filter (option)

3 Indicator: backup lamp is in use

When the red segment in the knob (1) lights up, the backup bulb is in use.



Note:

If the first lamp has failed and the backup lamp is in use, make sure to have a backup lamp module ready at hand as a precaution.

4 Yellow indicator lamp

Lights when the bulb has failed, or if the lamp module is defective. After activation and ignition of the backup bulb, the yellow indicator lamp turns off again.

5 Manual function

When the manual function has been activated, all electrical control systems are disabled. The bulb brightness is automatically adjusted to a fixed setting.

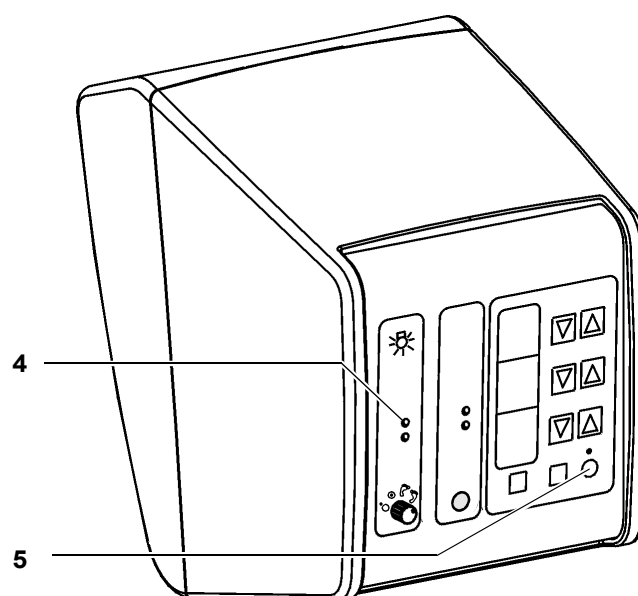
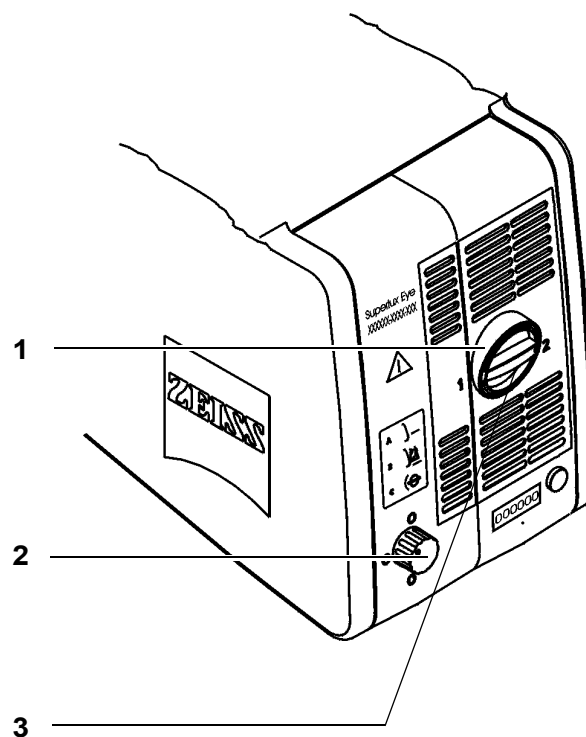


Warning!

Software and hardware failure may increase the brightness of the xenon light source, leading to retinal injury in the patient's eye.

If several successive beeps are emitted and the xenon lamp is lit when the system is switched on, this indicates a malfunction of the xenon light source.

- Attach a sign to the system stating it is out of order and contact our service representative.



Superlux Eye light source with integrated halogen light source (option)



Warning!

The xenon lamp has a limited service life of 500 h.

If used beyond its maximum service life, the xenon lamp may explode.

- Replace the xenon lamp in good time.
- Reset the service hour counter to "0" after replacing the lamp.
- For the lamp change procedure and how to reset the service hour counter, see "Switching to the backup lamp" on page 38.



Warning!

Lamp rupture (audible as a loud bang) may lead to jamming of the lamp module and/or failure of the electronics modules.

- Before opening the lamp housing, make sure that the system is moved to a position where neither the patient nor the user is put at risk by falling items.
- Do not continue using the system if the lamp module is jammed or the illumination is no longer operational due to defective electronics modules. Inform our service department.

1 Flap

The flap is the mechanical indicator for the operating status of the halogen lamps.

- When the flap is closed, the main lamp is operative.
- When the flap is open, the main lamp has failed. The backup lamp is on.

2 Switching to the backup lamp

The lamp housing contains a backup lamp which is automatically swung into the illumination beam path when the first lamp fails. If this automatic function fails, you can switch on the backup lamp by pressing this button.

3 Filter selector knob

The filter knob has four positions:



no filter



blue barrier filter (retina protection filter): use the blue barrier filter when operating on the eye. It protects the patient's retina against unnecessary (blue) radiation and permits the radiation exposure time to be increased by factor 3.



KK 40 filter:

to increase the color temperature



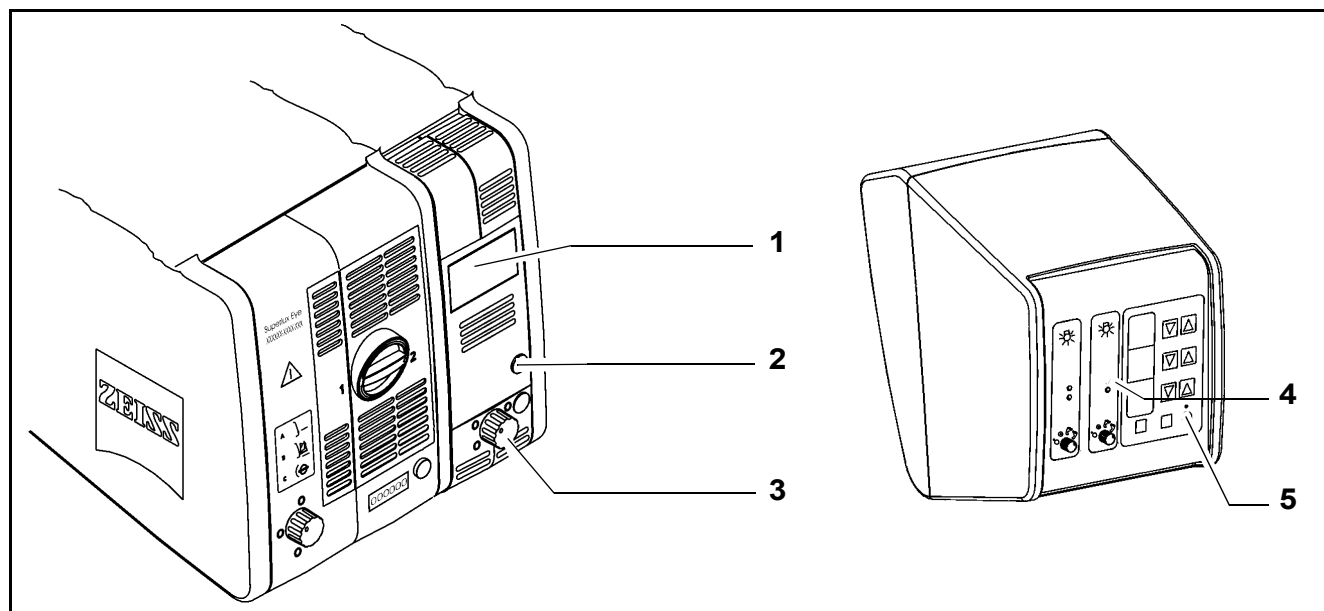
empty filter position

4 Yellow indicator lamp

- Lights when the main lamp has failed. In addition, open flap (1) on the lamp module indicates that the main lamp has failed. The back-up lamp is on.
- Blinks when the backup lamp has failed.

5 Manual function

When the manual function has been activated, all electrical control systems are disabled. The lamp brightness is automatically adjusted to a fixed setting.



Manual function

1 Manual button

The Manual button permits you to switch to manual operation. The motorized functions of the surgical microscope are deactivated. The lamp brightness is automatically adjusted to a default setting. This lamp brightness value is displayed in the first display field.

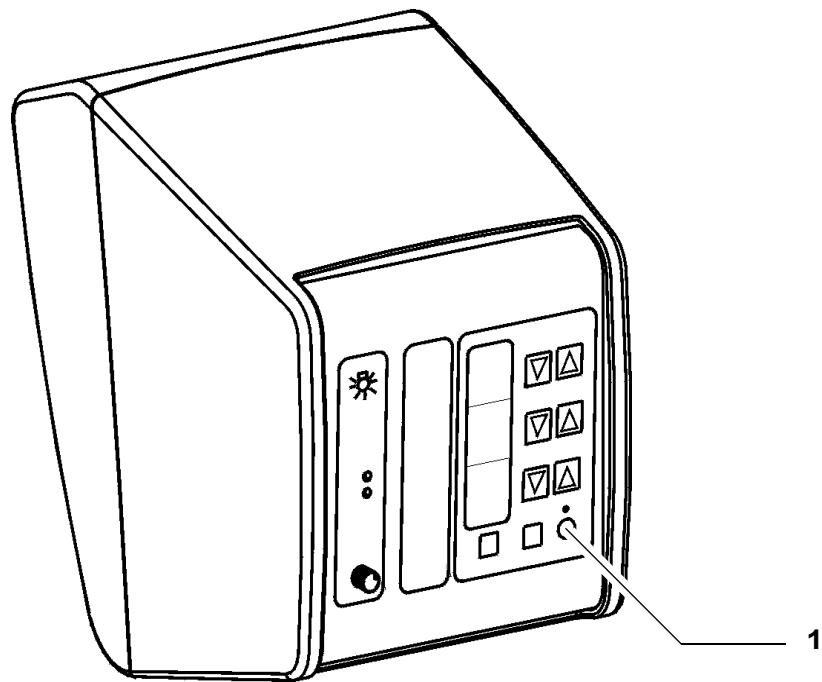
When you have switched to the manual mode, the yellow LED is lit and the blinking text "MANUAL" appears in the third display field

The surgical microscope can no longer be operated via the foot control panel, the handgrips or the control and display panel.

In the manual mode, you can use the foot control panel only to switch the light source on and off, and you can unlock the magnetic brakes by pressing the button on the microscope.

The manual mode is retained even if you switch the system off and back on at the power switch.

Press the Manual button a second time to reactivate electronic control. The basic mode is displayed again on the display and control panel.



Warning labels and notes

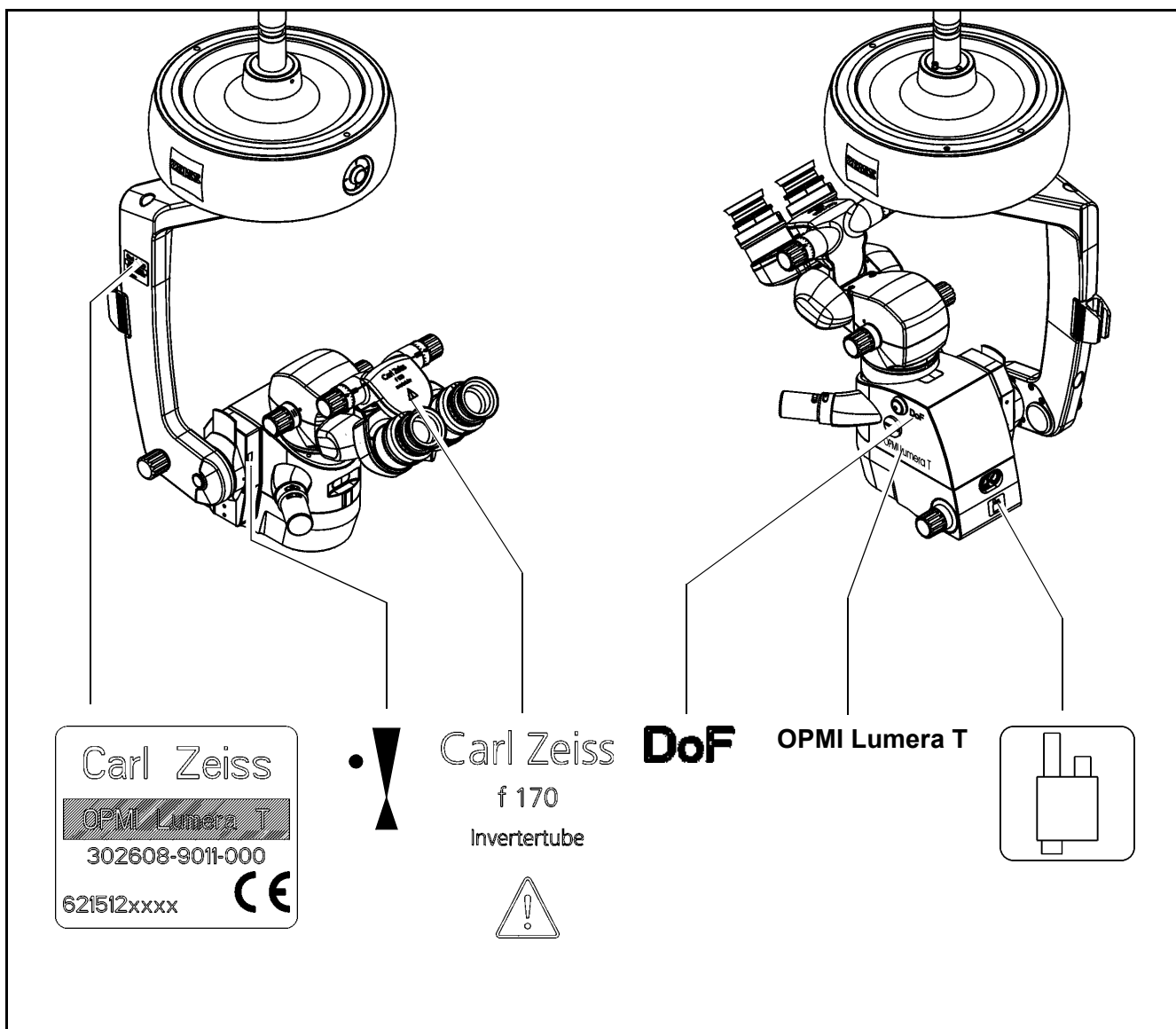


Caution:

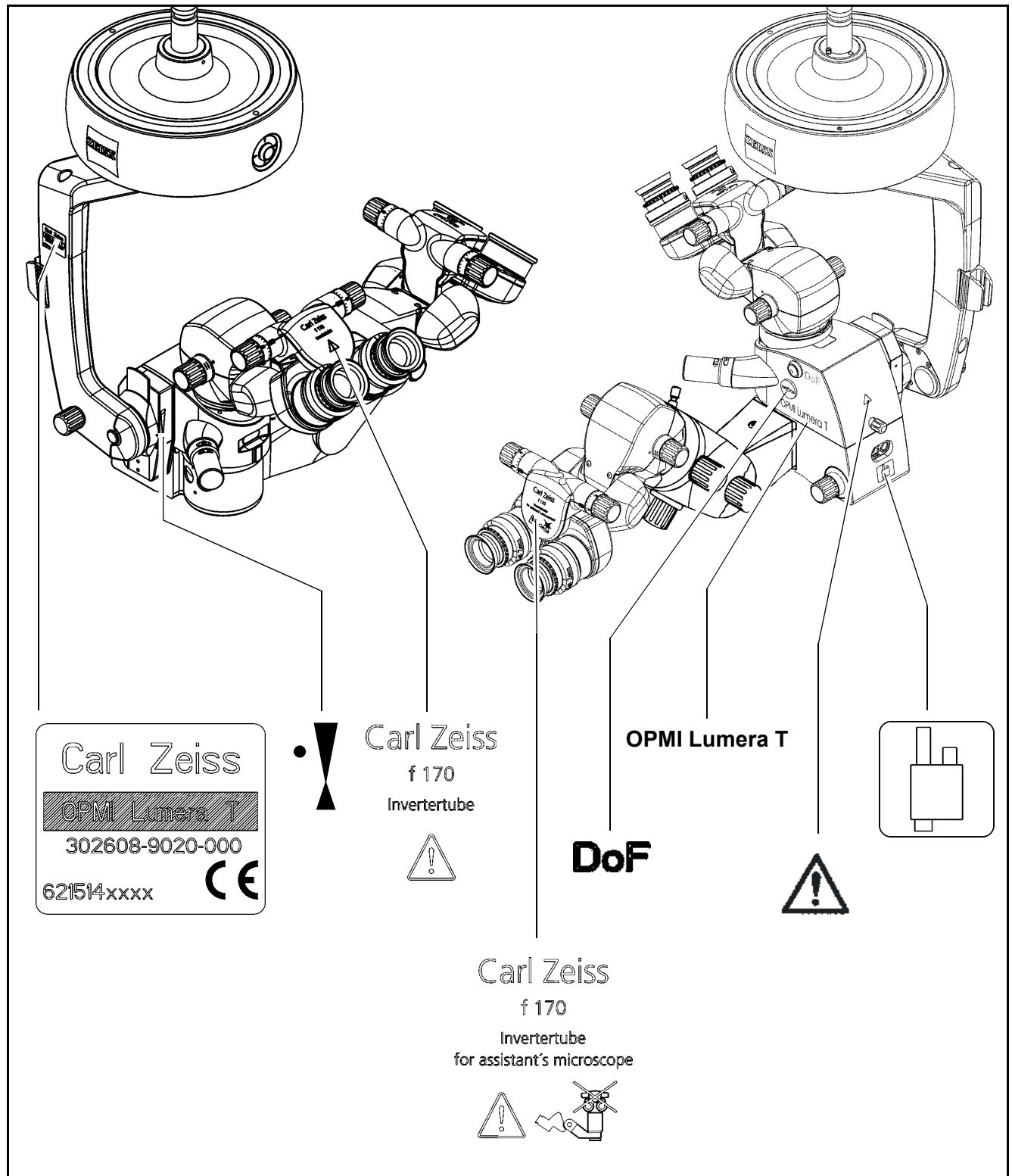
Observe all warning labels and notes!

If any label is missing on your instrument or has become illegible, please contact us or one of our authorized representatives. We will supply the missing labels.

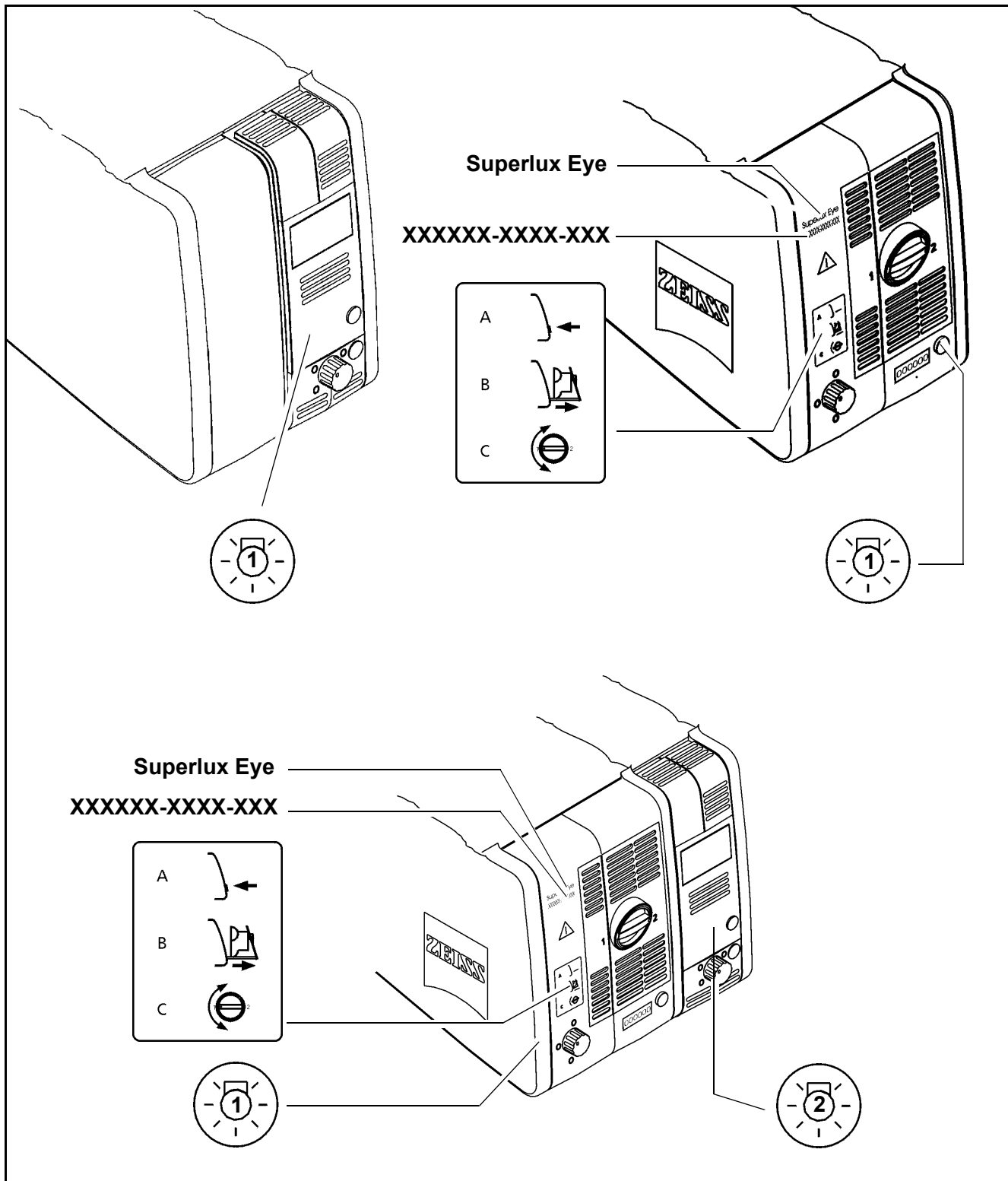
OPMI Lumera T (option)

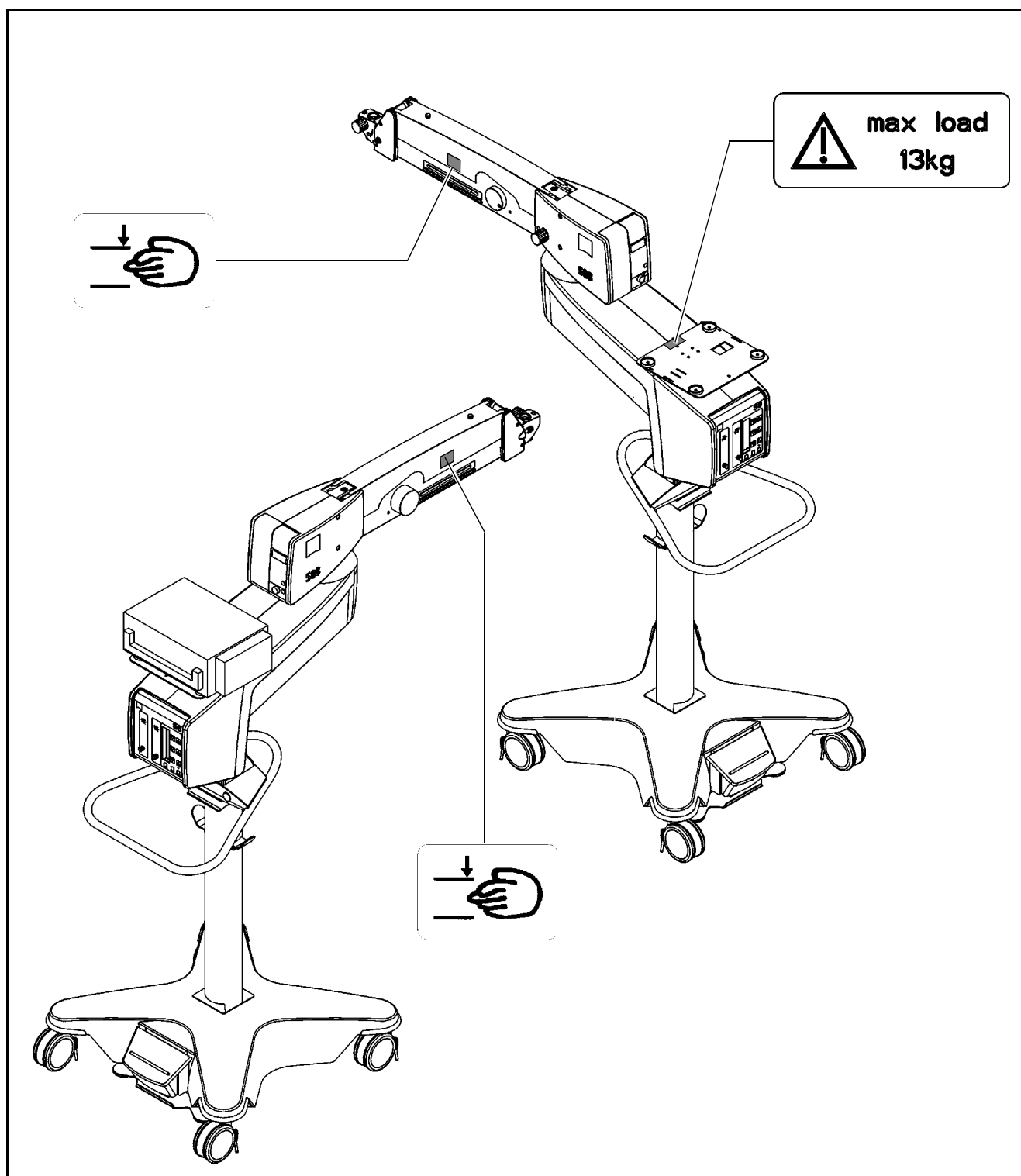


OPMI Lumera T with integrated assistant's microscope

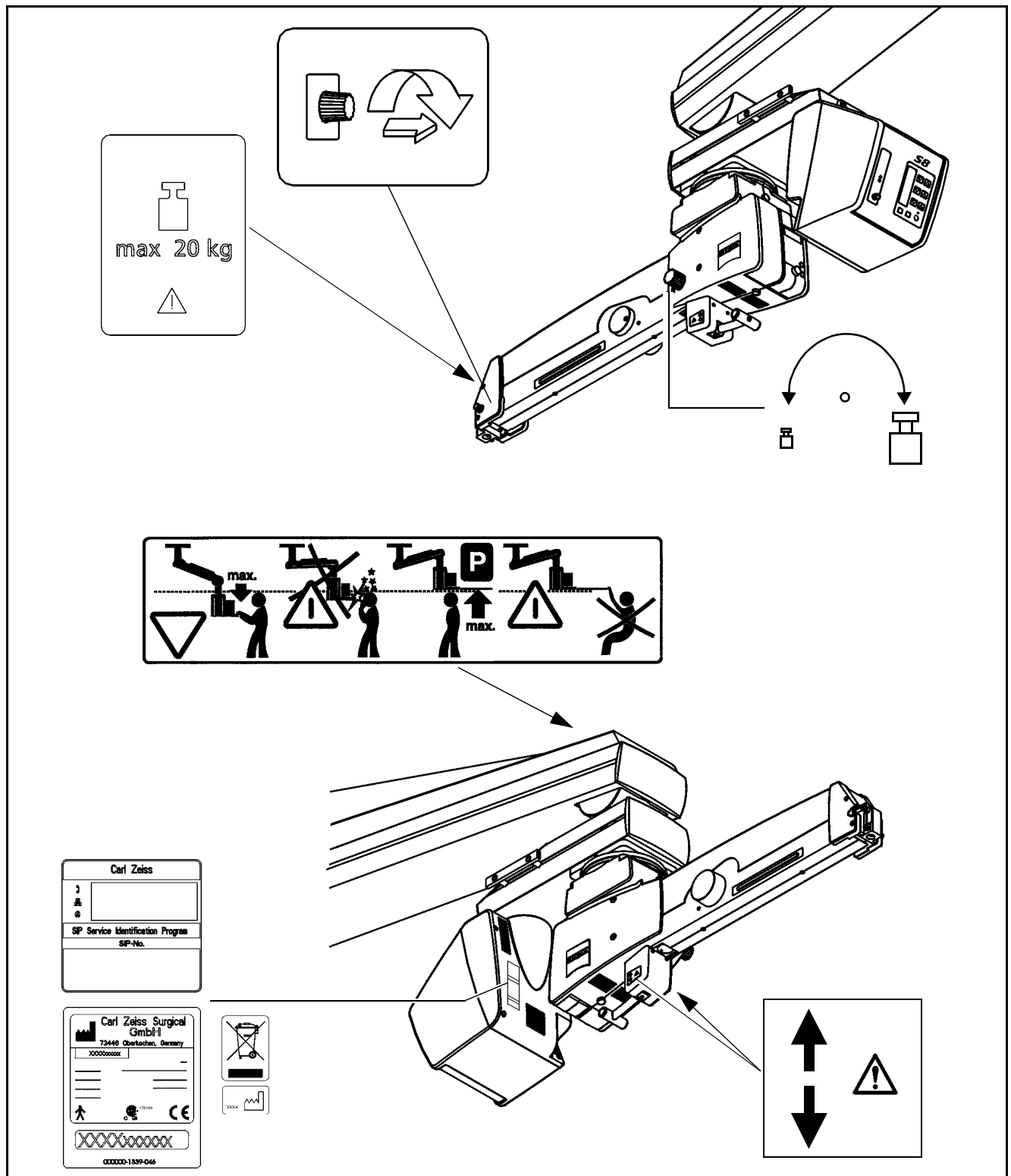


Light sources

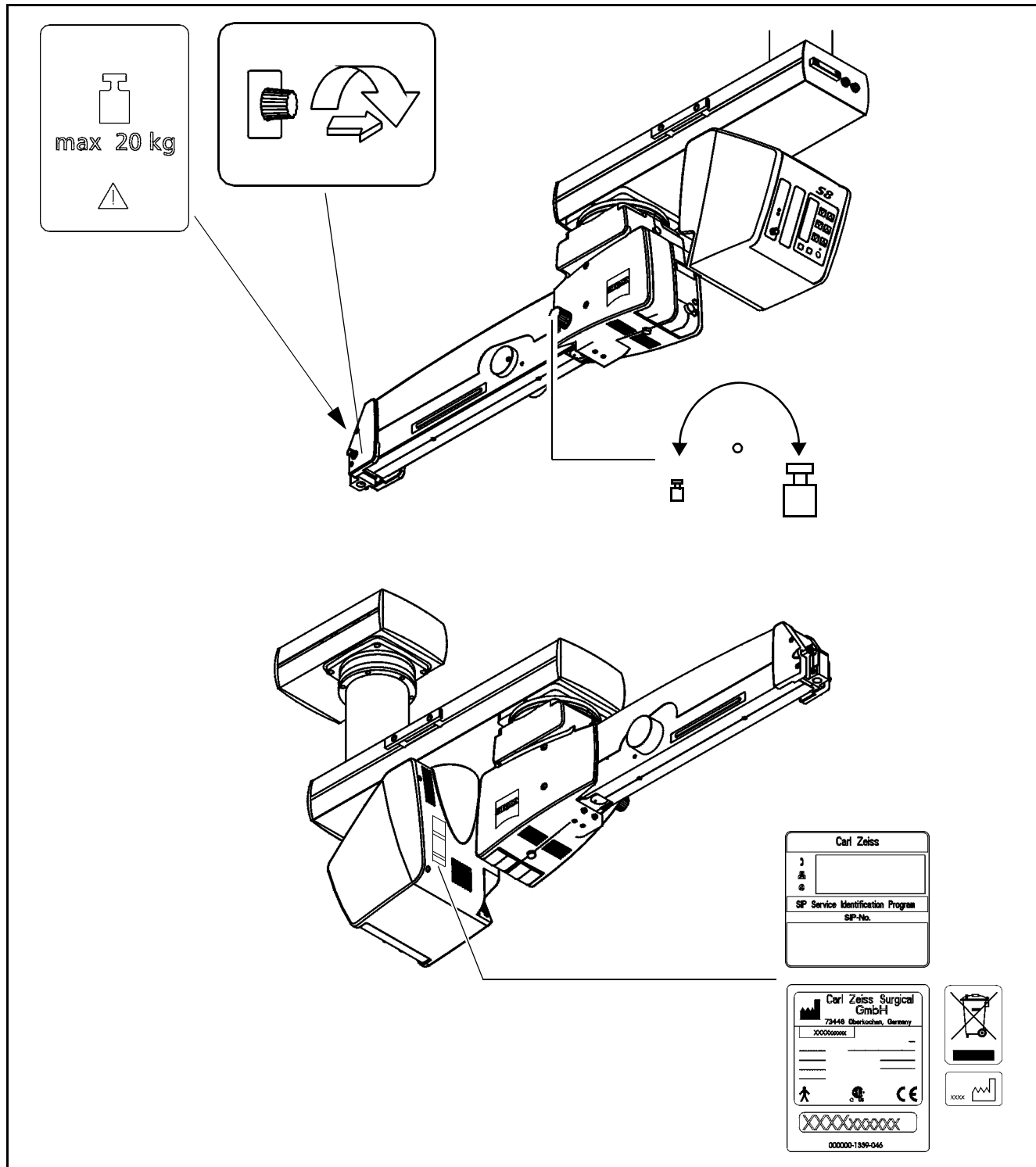


S88 floor stand with instrument tray option

S8 ceiling mount



S81 ceiling mount



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Lumera T surgical microscope

Intended use

The Lumera T surgical microscope has been designed for the magnified visualization of the field of view during surgical procedures in ophthalmology. The illumination system of the surgical microscope features red reflex illumination and surrounding field illumination, providing very effective illumination of the field of view and optimum visualization of the red reflex.



Note:

The illumination system of the Lumera T surgical microscope contains a UV blocking filter as a standard feature. This helps the surgeon to reduce the risk of phototoxic retinal injury in the patient.

Description of components

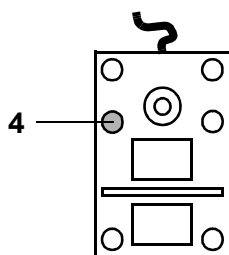
The Lumera T surgical microscope comprises the following components:

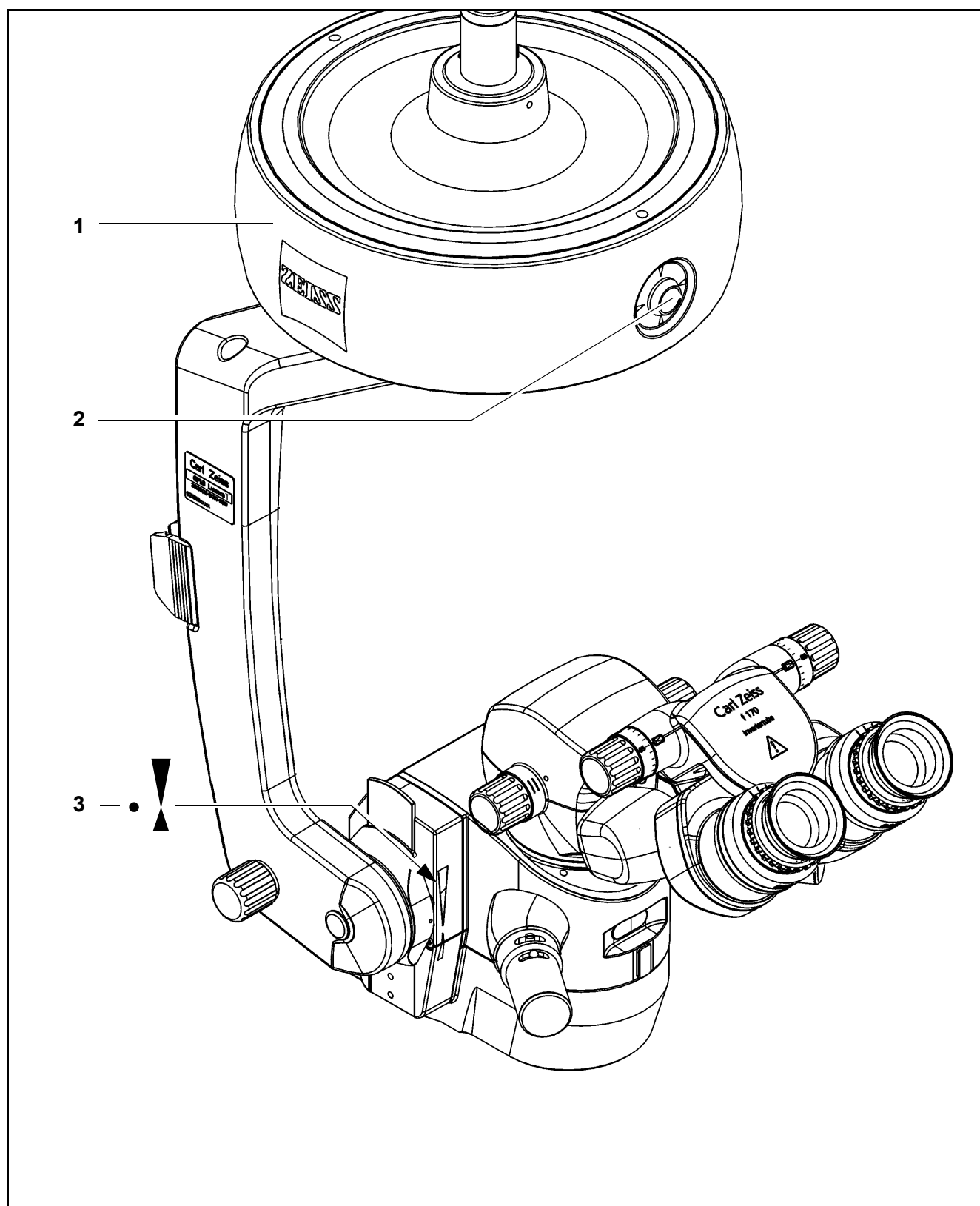
1 X-Y coupling

The X-Y coupling allows motorized fine positioning of the surgical microscope in a horizontal plane. The range of travel is 40 mm x 40 mm. The speed of travel can be set on the control panel of the suspension system.

The X-Y coupling is provided with a recentering mechanism. When you press reset button (2) or an appropriately programmed button of the foot control panel (4),

- the X-Y coupling adopts its center position,
- the focusing system of the surgical microscope is reset to its initial position (3).





2 Support arm for the surgical microscope

The support arm incorporates a tilt device (3). This allows the viewing direction of the surgical microscope to be adapted to the requirements of the surgical field. Using the knob for fine tilt, you can position the surgical microscope in a range from +90° to -90° (+ in the direction of the surgeon and - in the opposite direction). The +90° setting is ideal for surgery on patients in a seated position or lying on their side.



Caution:

Do not tilt the microscope beyond + / -90°, as this could damage the microscope cable or the light guide.

3 Knob for tilt device

4 Surgical microscope

The apochromatic optics of the surgical microscope provide superb optical quality. The microscope image displays optimum contrast and excellent detail recognition along with a large depth of field. The bright microscope image is a particular benefit in vitreoretinal surgery. A 1:6 ratio zoom system allows the magnification of the overall system to be set as required by the surgical procedure. Two apochromatic objective lenses with focal lengths of 175 mm and 200 mm are available for different working distances.

5 Invertertube for the main surgeon

6 Invertertube for the assistant

Tubes (5) and (6) offer an inverter function for ophthalmic applications. The inverter is used to bring an inverted image created by a wide-angle observation system into the correct position. With the inverter deactivated, tubes (5) and (6) have the same optical function as normal tiltable tubes.

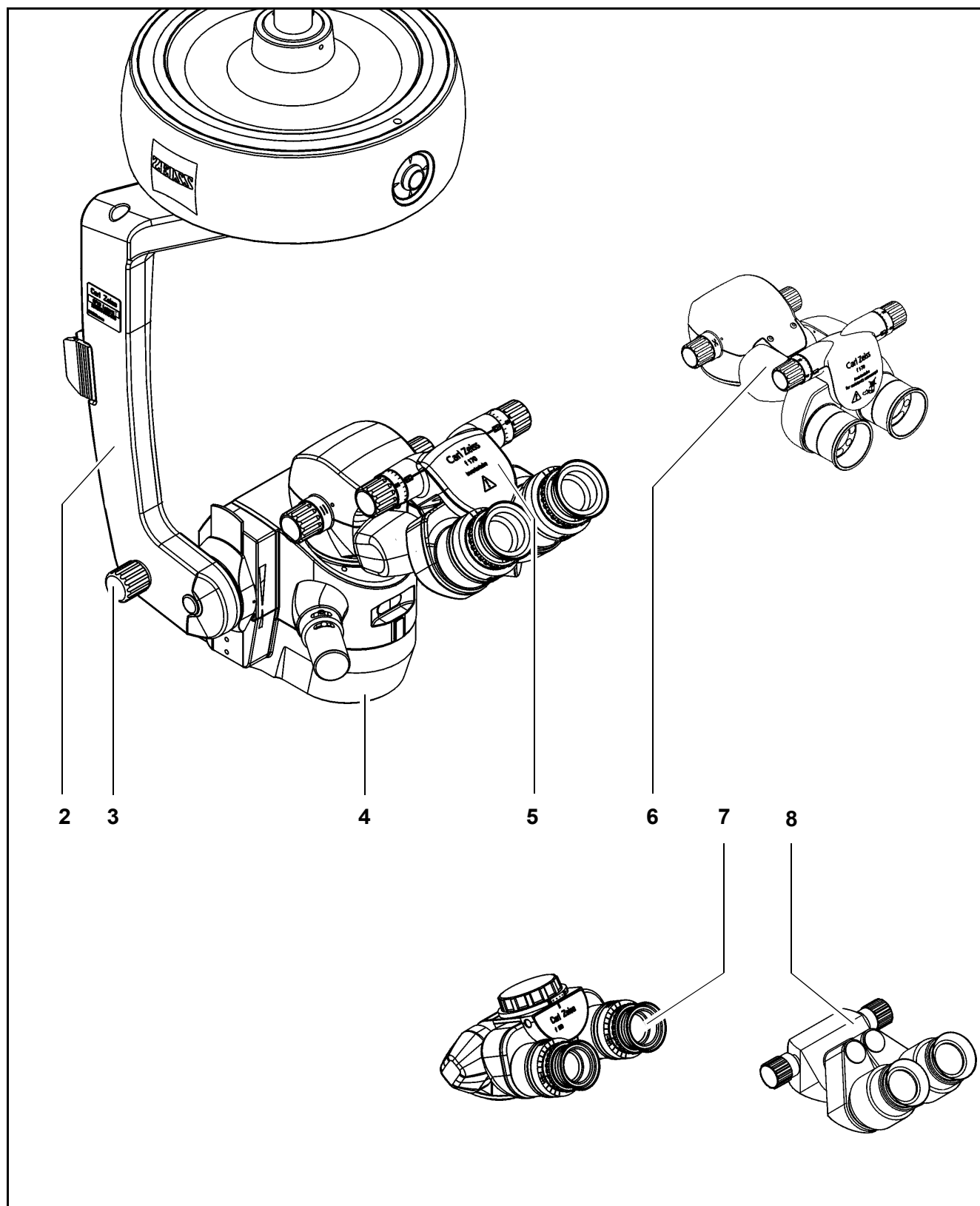
7 180° tiltable binocular tube (option)

Due to its large tilt range, the tiltable binocular tube allows optimum adaptation to extreme surgical conditions.

8 45° inclined binocular tube (option)

This tube is used as a viewing device for the surgeon. The viewing angle of 45° allows work with minimum fatigue.

The standard equipment includes eyepieces with a magnification factor of 10x (option: 12.5x).



9 Integrated assistant's microscope

The integrated assistant's microscope in its standard version comes as an integral part of OPMI Lumera T. The assistant sees the same image as the main surgeon in the same image quality.

The assistant's microscope has two working positions. They are located on the right and left of the main surgeon at an angle of 90° to the main surgeon's viewing direction. No locking mechanism has been provided, allowing the assistant to move the assistant's microscope by a certain amount out of the 90° position, if necessary.



Warning!

To prevent the assistant's microscope from moving downward of its own accord when the main microscope is being tilted, the assistant's microscope must be adjusted and locked in position using screw (9) before surgery.

The assistant's microscope is equipped with a focusing system and a 5-step magnification changer. This enables the assistant to adjust his/her microscope image independently of the main surgeon.

The binocular tube can be turned by $\pm 12^\circ$ about the optical axis of the assistant's microscope. In addition, the assistant's microscope can be tilted by 15° . If the assistant finds the viewing angle too steep, an optical wedge (option) can be installed between the microscope body and the binocular tube to permit horizontal viewing.

The standard equipment includes eyepieces with a magnification factor of 10x, providing a low initial magnification. This offers the benefit of a wide field of view and an improved overview of the surgical field. The assistant sees the red reflex in both eyepieces.

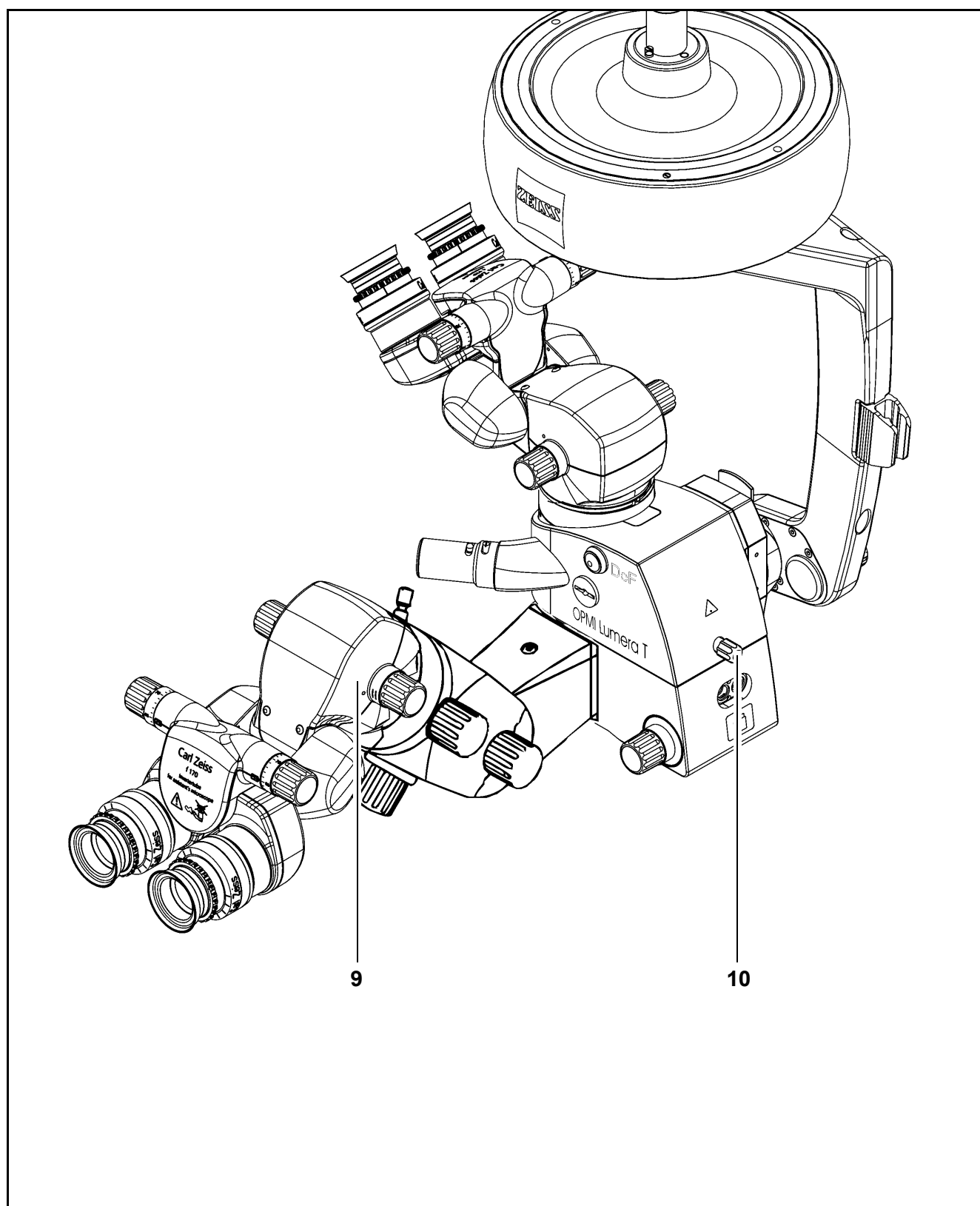
10 Locking screw for the integrated assistant's microscope

After adjusting the assistant's microscope as required, secure it in position using this screw.



Caution:

Please note the explanations given in the section "Adjusting the tilt motion" on page 174.



Illumination system

With red reflex illumination (stereo coaxial illumination) and surrounding field illumination, the illumination system of the surgical microscope has been specially tailored to the requirements of ophthalmic applications. The illumination options provide very effective illumination of the field of view and optimum visualization of the red reflex.

To protect the patient's eye, the illumination system is equipped with a retina protection device and a blue barrier filter (retina protection filter). The retinal protection device covers the patient's pupil and prevents light from entering the patient's eye. It is integrated in the surgical microscope and can be swung into the beam path when the red reflex is not needed. The blue barrier filter (retina protection filter) reduces the retinal exposure of the patient's and surgeon's eyes and permits the radiation exposure time to be increased by factor 3. It can be swung into the beam path of the light source in the suspension system.

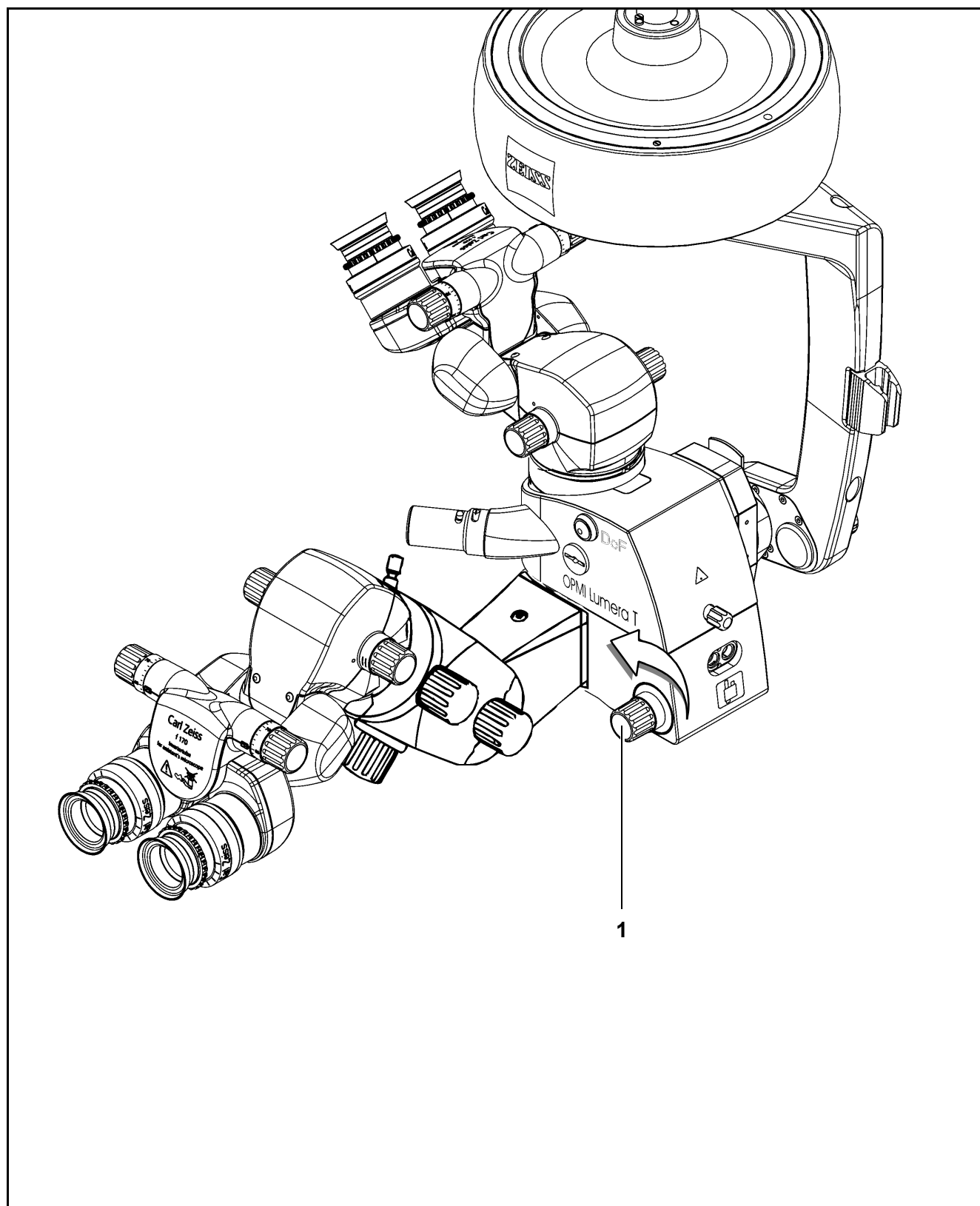
The light is supplied by a light guide which directs the light from the light source in the suspension system to the surgical microscope. To switch the light source and the illumination systems on and off and to control their brightness, you can use both the foot control panel and the control panel of the suspension system.

Surrounding field illumination

The surrounding field illumination is integrated in the surgical microscope and provides an optimally illuminated field of view with superb detail recognition. The brightness is controlled via the foot control panel or the suspension system. In addition, the intensity of the surrounding field illumination can be separately reduced or completely deactivated using knob (1) on the surgical microscope.

Red reflex illumination

The red reflex illumination (stereo coaxial illumination) is integrated in the surgical microscope and provides an optimally visible red reflex. For information on how to ensure optimum red reflex visualization, please see page 172.



Illumination settings

The type of illumination required can be selected using knob (1) on the surgical microscope.

Type of illumination



Red reflex illumination

This is the best setting to generate an optimum red reflex. Glare from the sclera is effectively reduced as only the central field of view is illuminated.



Red reflex with surrounding field illumination

This setting permits clear visualization of the red reflex combined with illumination of the surrounding field of view.



Surrounding field illumination

This setting is used for illuminating the field of view if no red reflex is required.



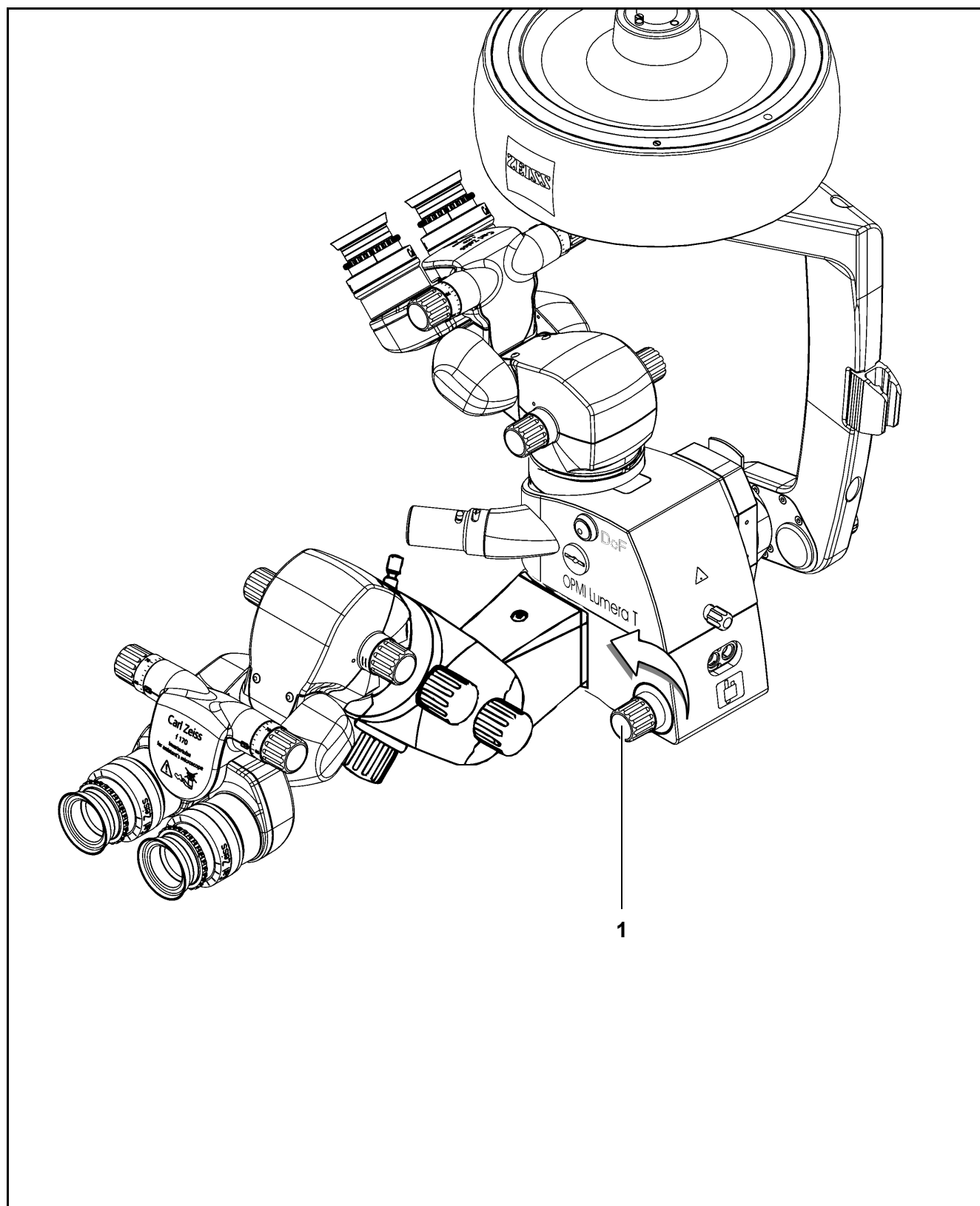
Surrounding field illumination with retina protection device

In this setting, a retina protection device is swung into the surrounding field illumination beam path. It prevents light from entering into the pupil and provides additional protection for the patient's eye against phototoxic injury.



Warning!

- Avoid looking directly into the light source, e.g. into the microscope objective lens or light guide!
- Adjust the illumination of patient's eye through the surgical microscope to a level which ensures that the fundus is exposed to as little light as possible.
- If no red reflex is required, swing the retinal protection device into the beam path.
- When operating on the eye, use the blue barrier filter (retina protection filter). It protects the patient's retina against unnecessary (blue) radiation and permits the radiation exposure time to be increased by factor 3.



Controls, displays, connections

- 1 Securing screw
 - Prevents the coupling on the suspension arm from coming loose.
- 2 X-Y coupling
- 3 Reset button
 - Recenters the X-Y coupling.
 - Resets the focus to its initial position in the focusing range



Note:

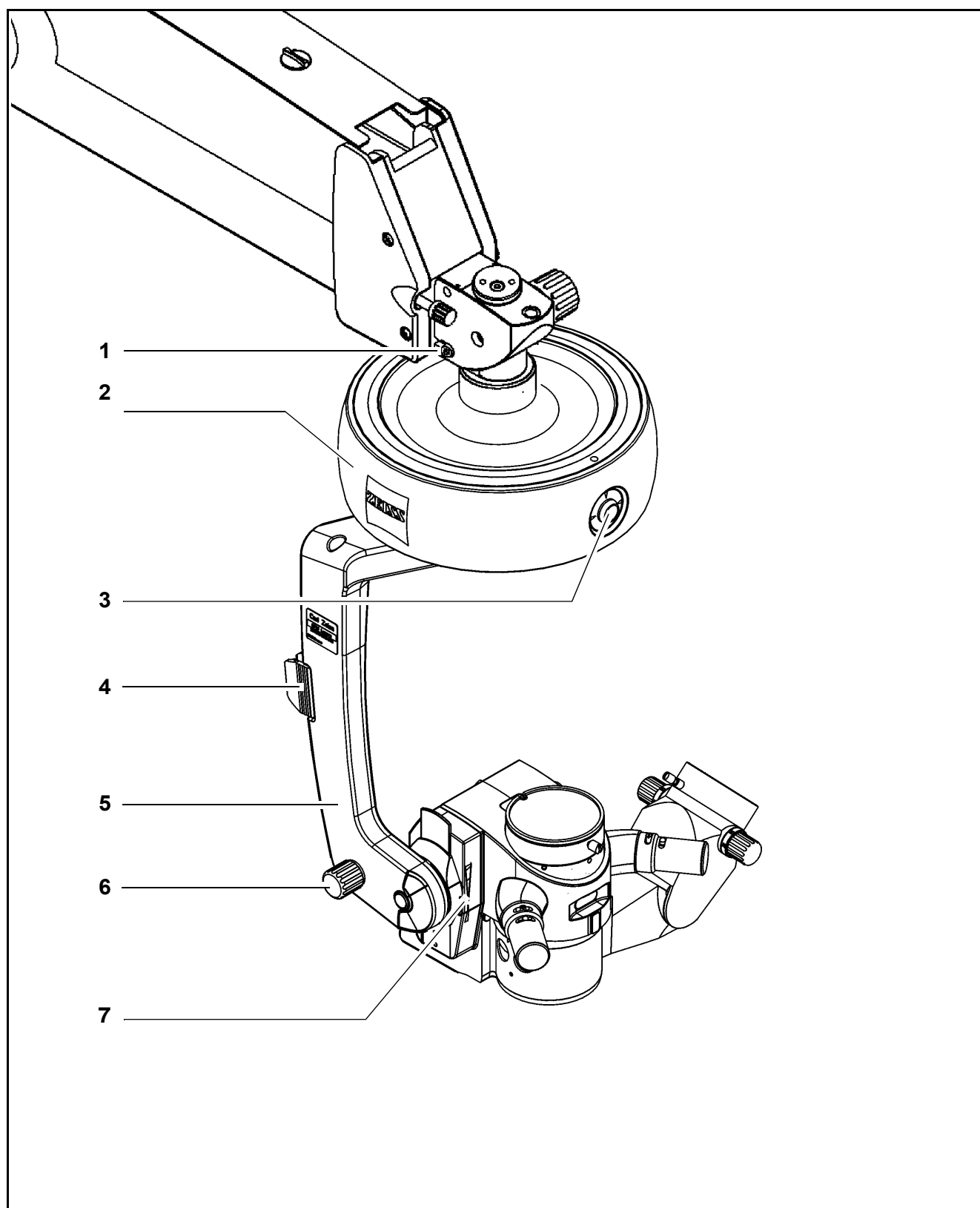
Press this button to start the recentering movement. To stop this movement, press the button again.

You can also stop the recentering movement by briefly tipping on one of the buttons on the foot control panel.

- 4 Cable and light guide clip
- 5 Support arm with tilt device
- 6 Knob
 - for setting the tilt angle of the surgical microscope;
 - +90° in the direction of the surgeon,
 - 90° in the opposite direction.



- 7 Arrows indicating the focusing range
 - If the dot is located between the two arrow tips, the focusing system of the surgical microscope is in its starting position.



8 Dust cover

9 Switch for unlocking the magnetic brakes of the suspension system

10 Clamp for asepsis caps

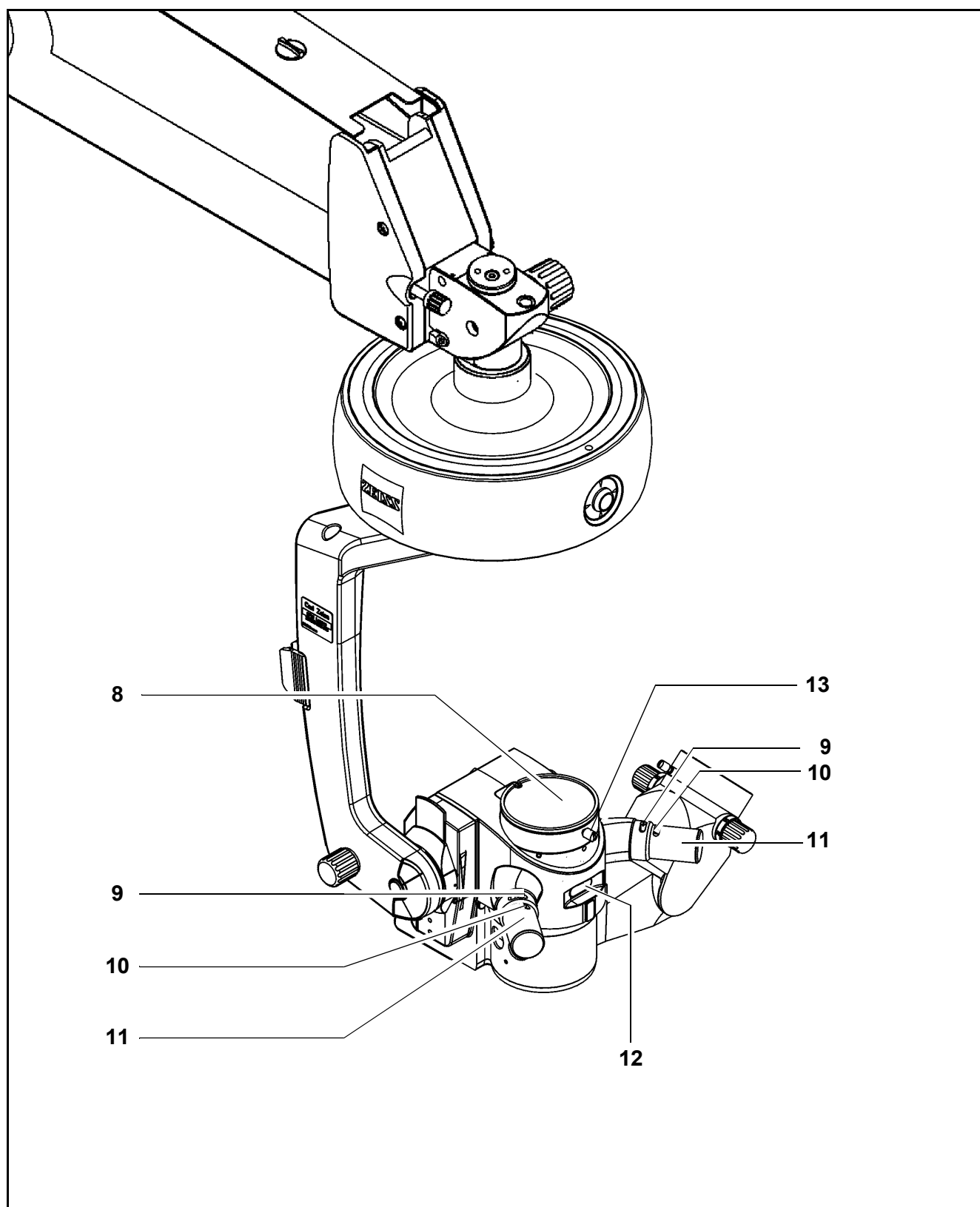
11 Handgrips for positioning the surgical microscope

With asepsis caps attached, the handgrips are used to position the microscope and unlock the magnetic brakes.

- Handgrip turned Magnetic brakes are unlocked, the device can be moved as required.
- Handgrip not turned Magnetic brakes are locked, the device cannot be moved.

12 Display of the zoom system's magnification factor

13 Securing screw for tubes or accessories



14 DeepView button (depth of field (DoF) management system)

Allows you to optimize the light transmission or depth of field, depending on the application involved. When this function is deactivated (LED not lit), the microscope is optimized for light transmission. When this function is activated (green LED is lit), the microscope is automatically set to optimized depth of field in accordance with the selected magnification. This mode is primarily recommended for procedures on the anterior segment where high depth of field is required.

The next time the system is switched on, the mode last selected will be activated.

15 Manual adjustment of the zoom system in the emergency mode**16 Selection knob for different types of illumination****Red reflex illumination**

This is the best setting to generate an optimum red reflex. Glare from the sclera is effectively reduced as only the central field of view is illuminated.

**Red reflex with surrounding field illumination**

This setting permits clear visualization of the red reflex combined with illumination of the surrounding field of view.

**Surrounding field illumination**

This setting is used for illuminating the field of view if no red reflex is required.

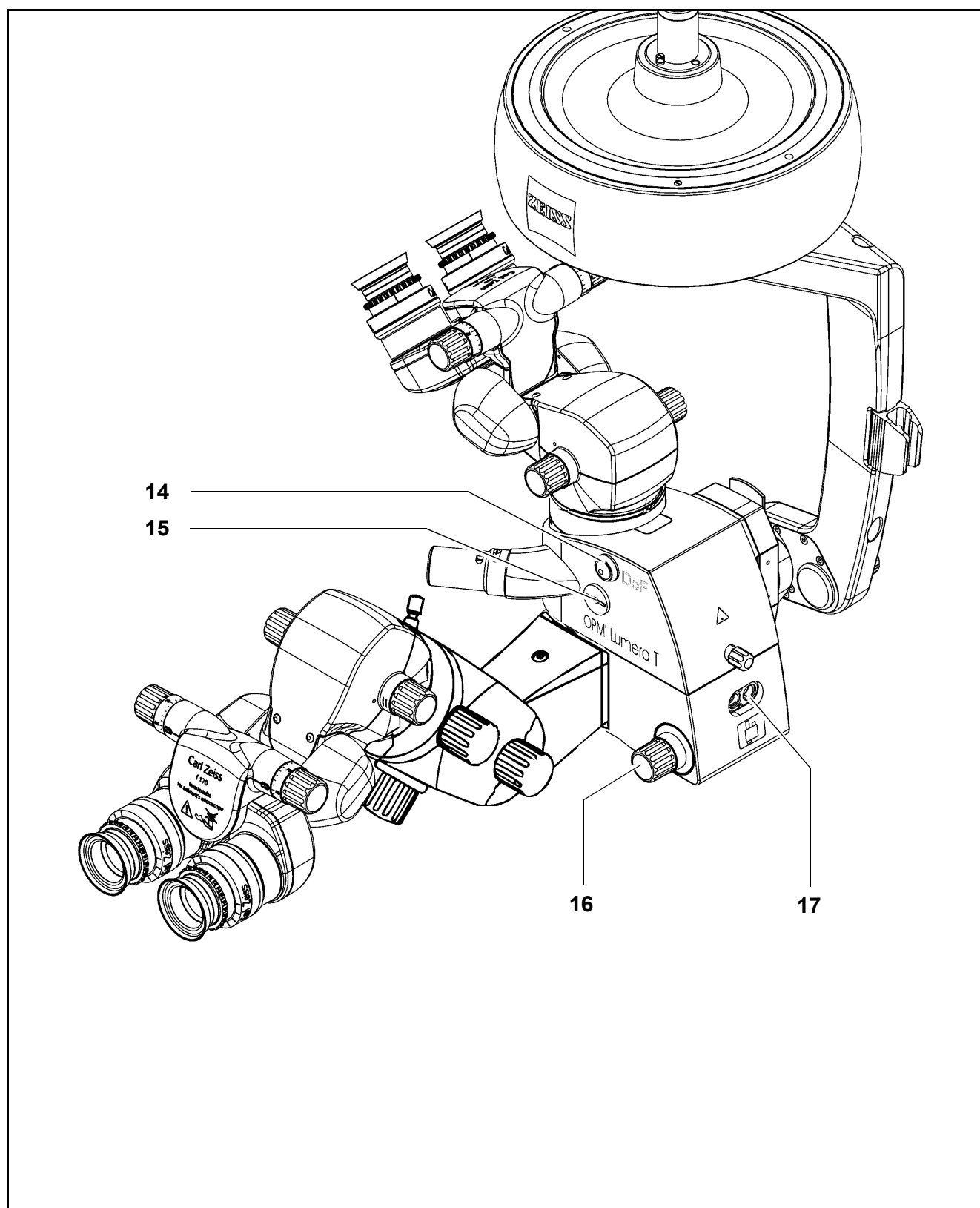
**Surrounding field illumination with retina protection device**

In this setting, a retina protection device is swung into the surrounding field illumination beam path. It prevents light from entering into the pupil and provides additional protection for the patient's eye against phototoxic injury.

17 Light guide connector**Caution:**

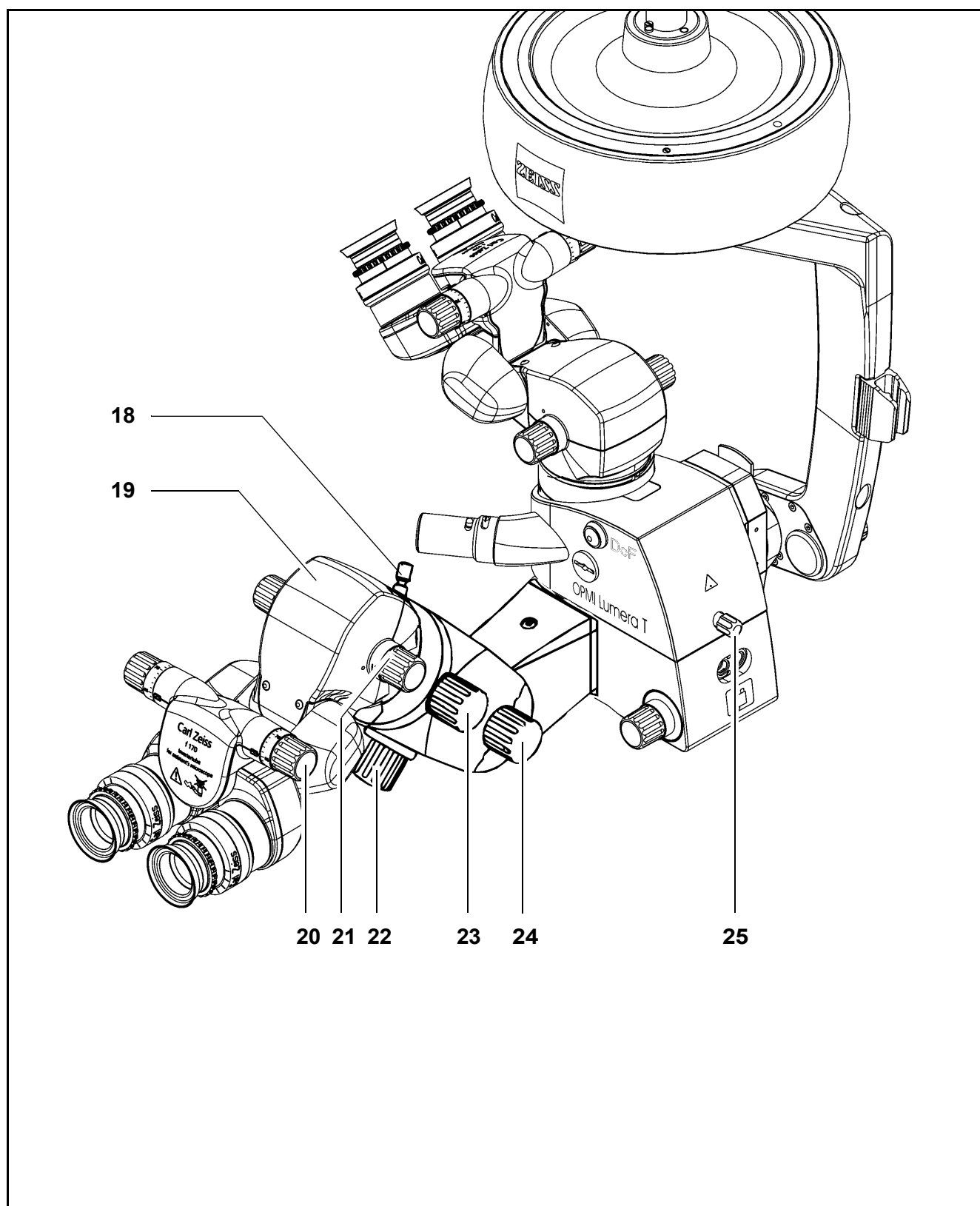
Take care not to damage the light guide connector and light guide!

- Always insert the correct end of the light guide into the light guide connector. For correct mounting, please see the label provided under the light guide connector (17).



The integrated assistant's microscope comprises the following components:

- 18** Clamping screw for locking the coobservation tube in position within the 12° range of rotation. After adjusting the assistant's microscope as required, secure it in position using this screw. Firmly tighten the clamping screw by hand.
- 19** Coobservation tube
 - Invertertube for the assistant (standard)
- 20** Knob for setting the interpupillary distance (54 mm to 76 mm)
The correct position has been reached when the two eyepiece images merge into one.
- 21** Inverter selection knob
The inverter can be turned about 360° and snaps in at the two defined positions.
- 22** Focusing knob
for focusing the assistant's microscope independently of the main surgeon.
- 23** Manual magnification changer
- 24** Clamping screw for locking the tilt position
of the integrated assistant's microscope within the 15° tilt range. After tilting the integrated assistant's microscope as required, secure it in position using this screw. Firmly tighten the clamping screw by hand.
- 25** Clamping screw for locking the assistant's microscope in position
After adjusting the assistant's microscope as required, secure it in position using this screw. Firmly tighten the clamping screw by hand.



Binocular tubes and eyepieces

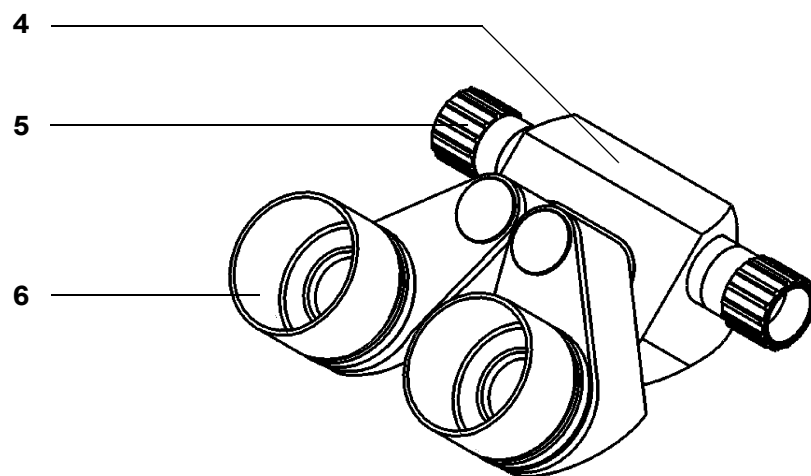
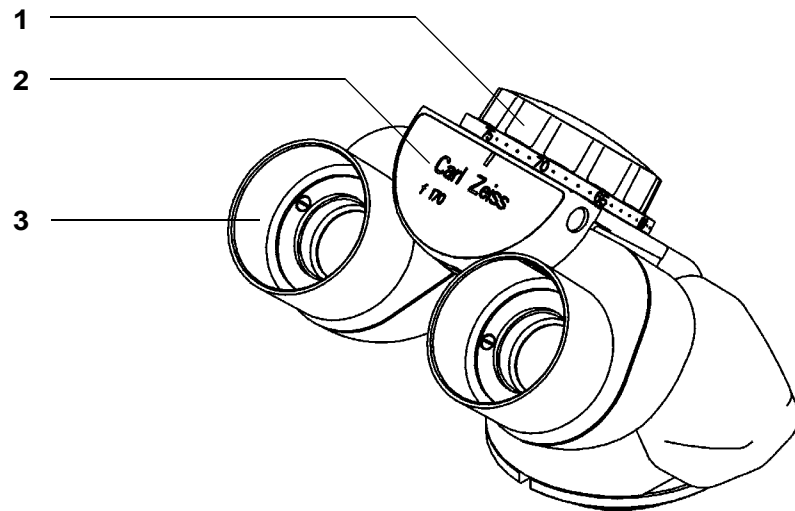
You can mount a 180° tiltable tube, an Invertertube or a 45° inclined tube on the Lumera T surgical microscope as required (see the following pages).

180° tiltable tube

- 1 PD adjustment knob
The correct position has been reached when the two eyepiece images merge into one. You can read off the interpupillary distance set on the adjustment knob.
- 2 180° tiltable tube
- 3 Eyepiece mount

45° inclined tube

- 4 45° inclined tube
- 5 PD adjustment knob
The correct position has been reached when the two eyepiece images merge into one. You can read off the interpupillary distance set on the adjustment knob.
- 6 Eyepiece mount



Invertertube™

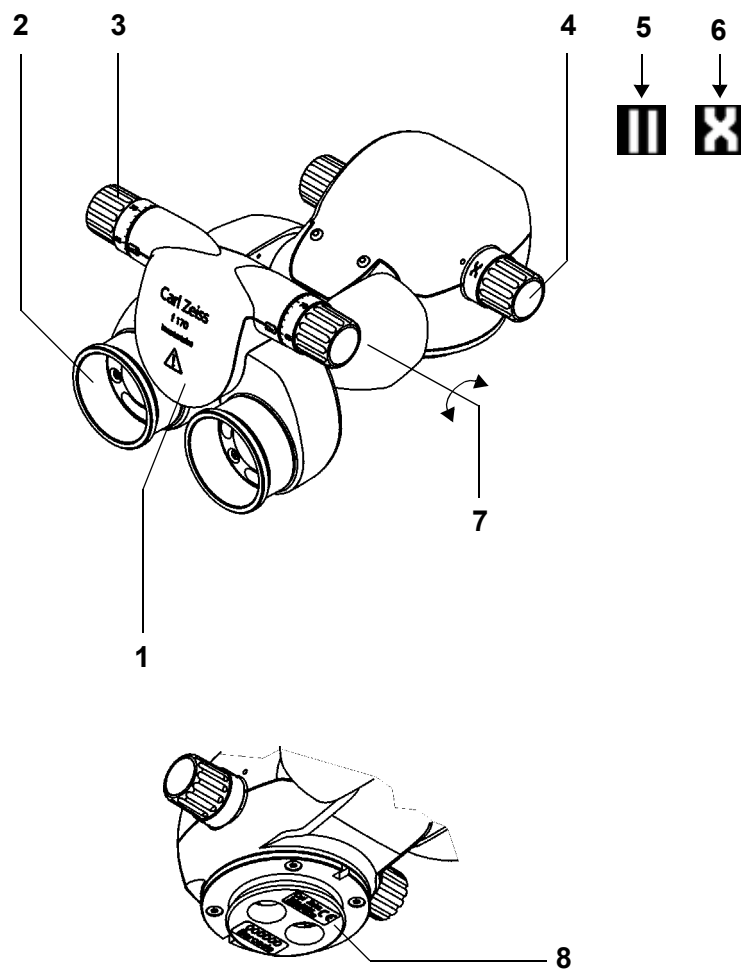
The tiltable tube has an inverter function and has been designed for ophthalmic use. Many wide-angle observation systems for the posterior segment of the eye provide an inverted intermediate image which is viewed through the surgical microscope. The inverter is used to erect an inverted image.

When activating the wide-angle observation system, you must also activate the inverter of the tiltable tube. When swinging out the wide-angle observation system, you must also deactivate the inverter of the tiltable tube again.

With the inverter deactivated, the tiltable tube has the same optical function as a normal tiltable tube.

To ensure sterility, the controls can be equipped with sterilizable caps.

- 1** Invertertube - 110° tiltable binocular tube
- 2** Eyepiece mount
- 3** Knob for setting the interpupillary distance (54 mm to 76 mm)
The correct position has been reached when the two eyepiece images merge into one.
- 4** Inverter selection knob
The inverter can be turned about 360° and snaps in at the two defined positions.
- 5** Symbol for **deactivated** inverter on the inverter selection knob
- 6** Symbol for **activated** inverter on the inverter selection knob
- 7** Lateral tilt axis
-10° to +100°
- 8** Cat. No.
If you have any questions for our service staff, please always specify the relevant Cat. No.



Widefield eyepieces with magnetic coupling



Note:

When the eyepiece has been removed from the tube, please remember that it is equipped with a magnetic coupling. Attached eyepieces produce a very minor magnetic field, i.e. the usual regulations for the handling of magnets must only be observed with non-attached eyepieces.

- Do not place the eyepiece near instruments which may be magnetizable.
- Do not place the eyepiece on sensitive electronic instruments such as infusion pumps, heart pacemakers, measuring instruments or magnetic data carriers such as disks, audio/video tapes or credit cards.
- Always store the eyepiece in its original packaging, when not using it.

1 Eyecup

Always adjust the eyecups in such a way that the entire field of view can be seen.

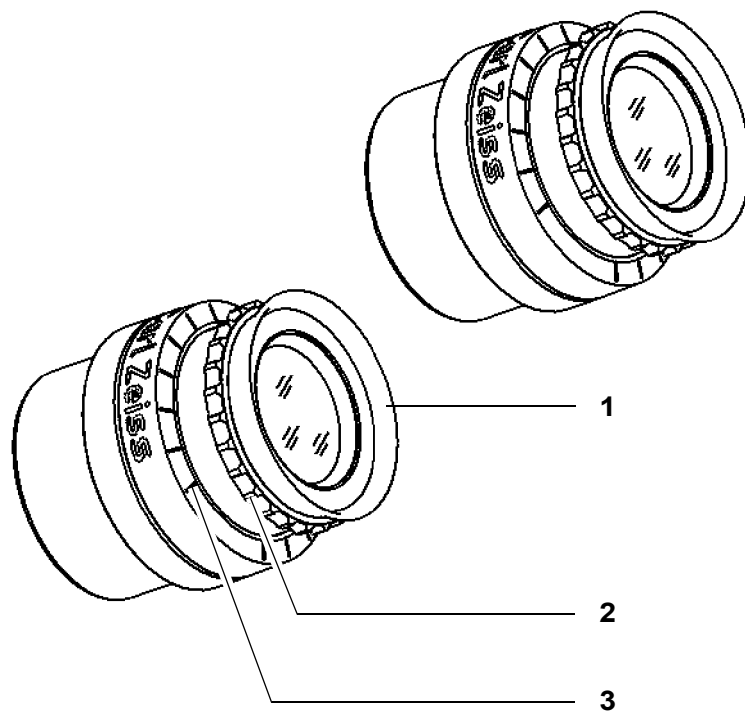
- Viewing with eyeglasses: Screw in the eyecups all the way.
- Viewing without eyeglasses: Adapt the eyecups to the viewer's field of view by screwing them outward.

2 Diopter setting ring

The eyepieces enable you to set your prescription between -8 D and +5 D. Eyeglass wearers using their glasses during work should set the diopter setting ring to 0. Turn the ring until the optimum setting has been achieved. An integrated brake holds the setting ring in the position set.

3 Diopter scale

For reading off the prescription set.



Light sources

The suspension system is equipped either with a halogen light source, a Superlux Eye light source or with a Superlux Eye light source with an additional, integrated halogen light source (option).

1 Superlux Eye light source

This illumination system comprises a xenon lamp featuring fiber illumination. The xenon lamp generates light whose spectrum resembles that of natural daylight. Regardless of the brightness setting, the color temperature of the light always remains the same. Normal daylight film without any additional conversion filters can therefore be used for photographic documentation. For changing the light spectrum, two Superlux Eye light sources with two xenon lamps and different swing-in filters are available. The second lamp is used as a backup lamp which must be manually swung into the illumination beam path when the first lamp fails. You have to pull out the lamp module all the way before being able to swing in the backup lamp.



Warning!

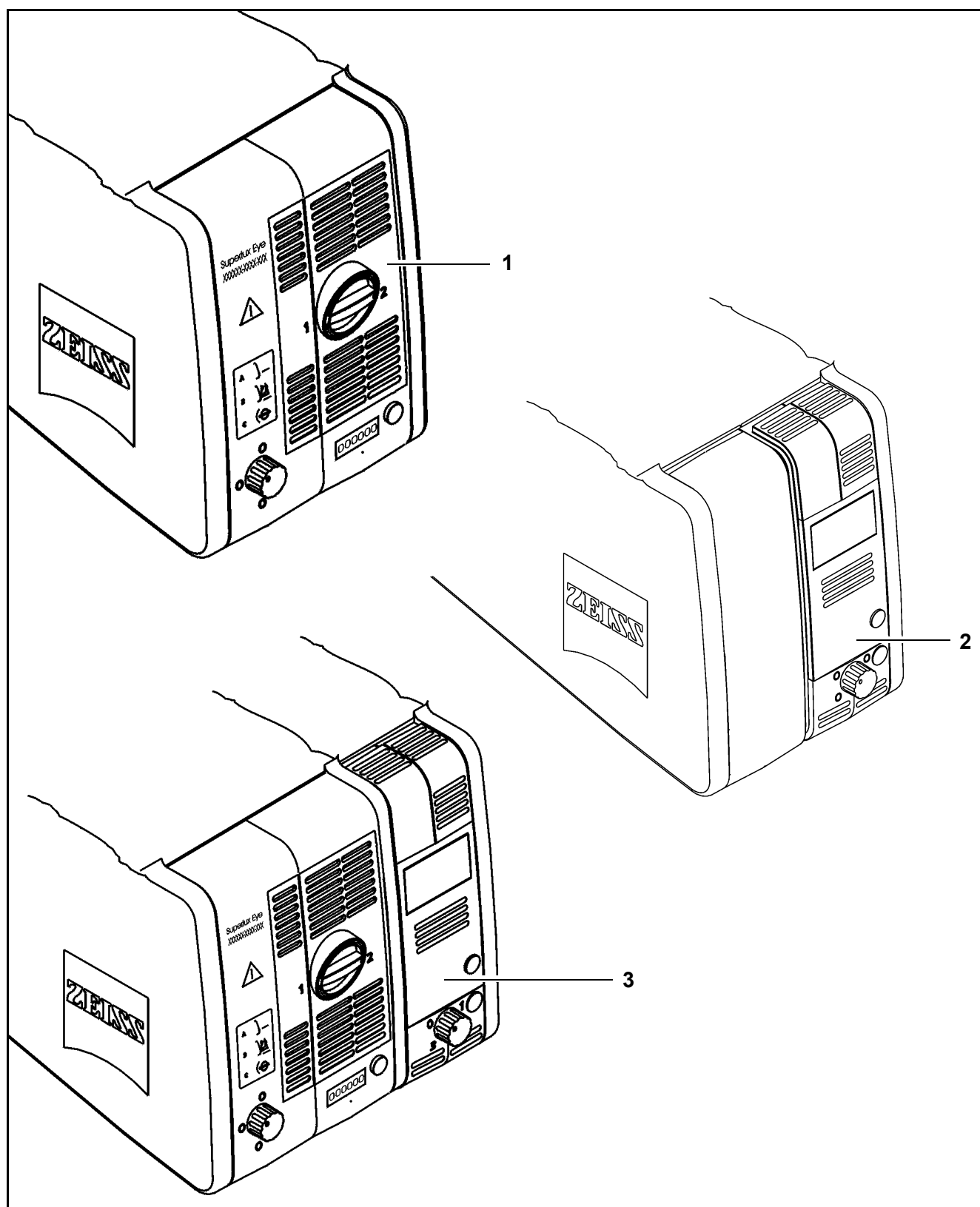
When using the Superlux Eye light source, only operate the system with special xenon lamps approved by Carl Zeiss for ophthalmic surgery. If any other than Carl Zeiss-approved xenon lamps are used, there is the risk of severe injury to the patient's eye.

2 Halogen light source (option)

This illumination system comprises a light source featuring fiber illumination. The lamp housing contains a backup lamp which is automatically swung into the illumination beam path when the first lamp fails. If required, the light source can be equipped with a second lamp housing so that two separate light sources are available for fiber illumination. The second light source can be used, for example, for a fiber slit lamp.

3 Superlux Eye illumination system with additional integrated halogen illumination (option)

The additional, integrated halogen illumination is a second illumination system suitable e.g. for the use of a fiber slit lamp.



Halogen light source (option)

The suspension system is equipped with a light source for fiber illumination. The lamp housing contains a backup lamp which is automatically swung into the illumination beam path when the first lamp fails. If required, the light source can be equipped with a second lamp housing so that two separate light sources are available for fiber illumination.



- 1 Lamp module
- 2 Ventilation grid
Do not cover the ventilation grid! For example, drapes could be covering the grid. This can lead to overheating of the lamp modules and to lamp failure.
- 3 Flap
The flap is the mechanical indicator for the operating status of the halogen lamps.
 - When the flap is closed, the main lamp is operative (green light (9) is on).
 - When the flap is open, the main lamp has failed. The backup lamp is used (yellow light (8) is on).
- 4 Manual activation of the backup lamp
If the automatic activation function fails, press this button to switch on the backup lamp.
- 5 Opening the lamp module
When you press this button, the lamp module is slightly ejected. Pull out the lamp module all the way for lamp change.
- 6 Filter selector knob
The filter selector knob has four positions:



no filter



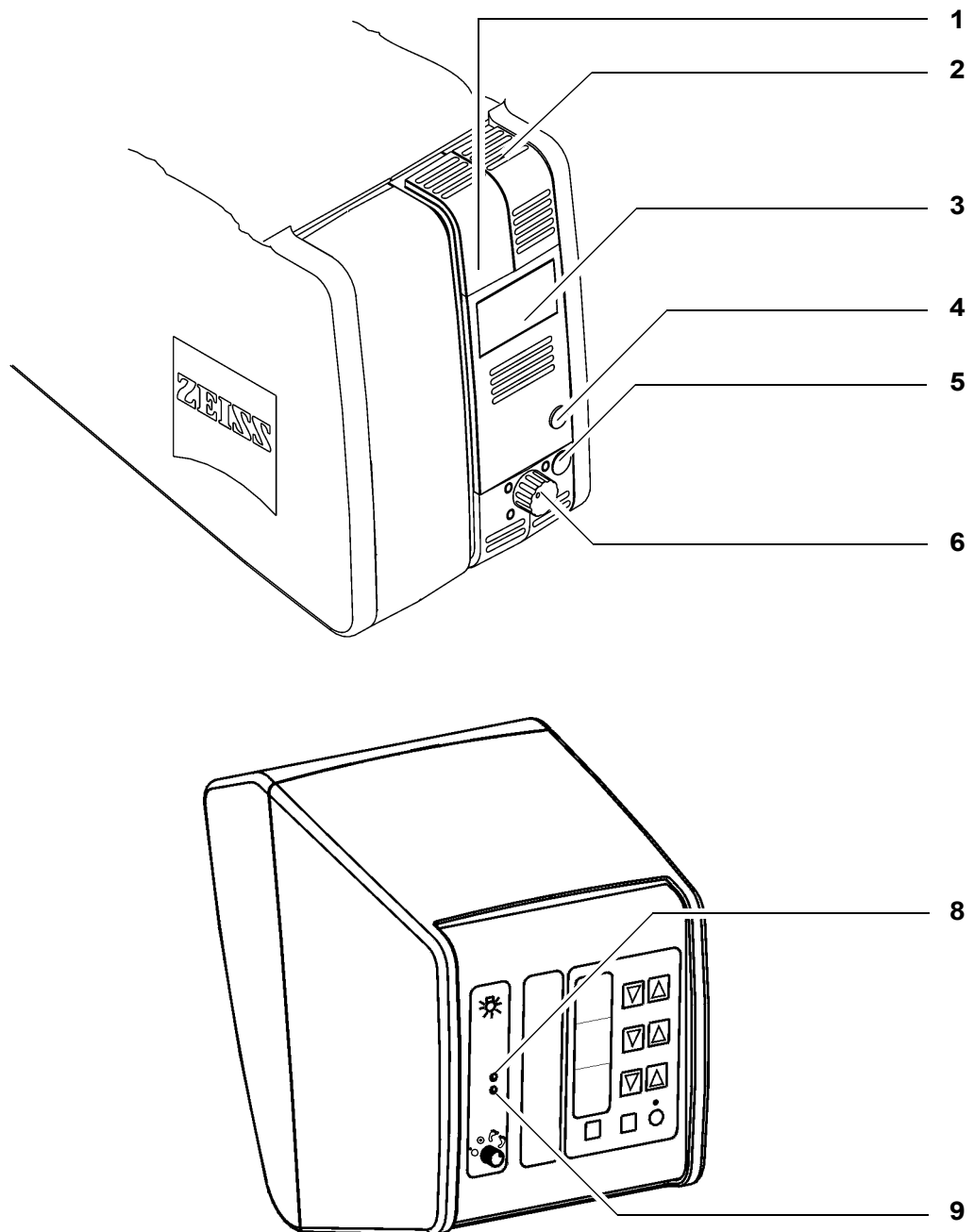
blue barrier filter (retina protection filter): when operating on the eye, always use this filter to protect the patient's eye against unnecessary radiation (retinal injury).



KK 40 filter:
to increase the color temperature



empty filter position



7 Brightness control

Brightness can be adjusted using the two keys (7) on the control panel.



Warning!

Too much light intensity (brightness setting is too high) or excessive radiation exposure times may lead to retinal injury in the patient's eye.

- Adjust the illumination intensity as required for the light source used and the radiation exposure time. You will find the values recommended by Carl Zeiss in the table "Maximum radiation exposure times" on page 29.



Note:

If the suspension system has two lamp housings, you can also adjust the brightness of lamp 1 by pressing the appropriate button(s) on the foot control panel.


8 Yellow indicator lamp


- Lights when the main lamp has failed. The backup lamp is on.
- Blinks when the backup lamp has failed.

9 Green indicator lamp

Lights when the respective light source has been switched on.

10 Selector:

-  The light source is off.

-  The light source is on.



The light source can be switched on/off on the **left-hand side** of the foot control panel.



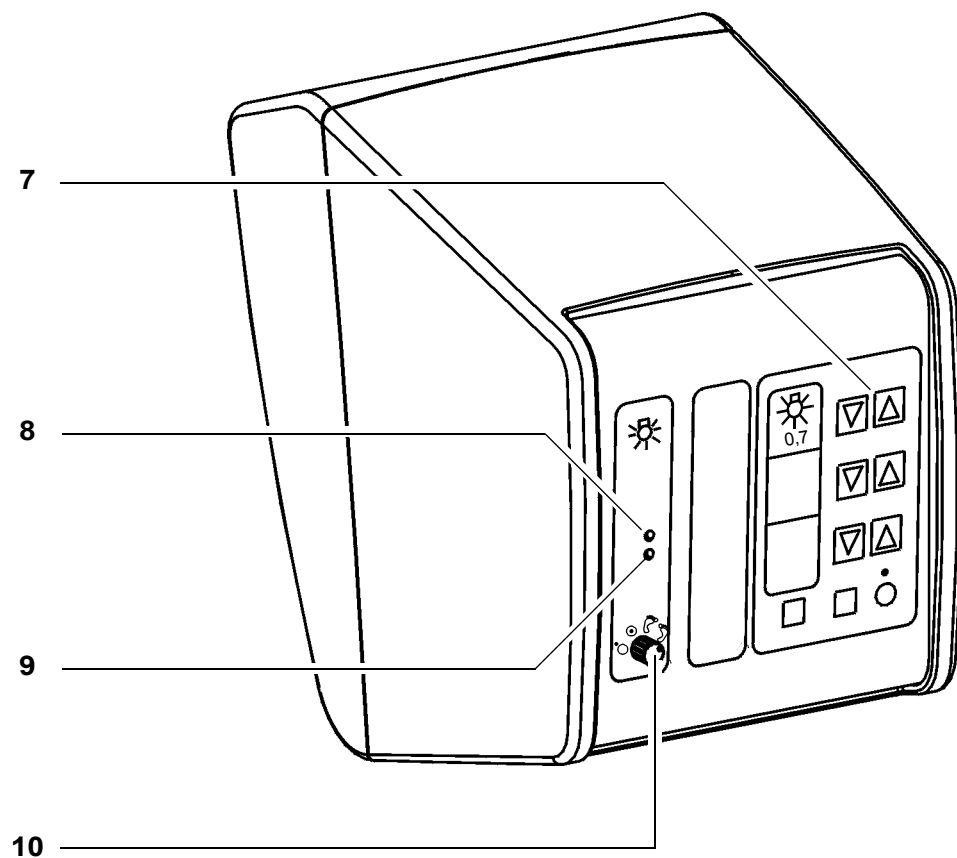
The light source can be switched on/off on the **right-hand side** of the foot control panel.



Note:

If two lamp housings are available, you can set the selector switch in such a way

- that one light source each can be switched on/off on the left-hand and right-hand side of the foot control panel,
- or that both light sources can be switched on/off on the left-hand or right-hand side of the foot control panel.



Superlux Eye light source



Warning!

The xenon lamp has a limited service life of 500 h.

If used beyond its maximum service life, the xenon lamp may explode.

- Replace the xenon lamp in good time.
- Reset the service hour counter to "0" after replacing the lamp.

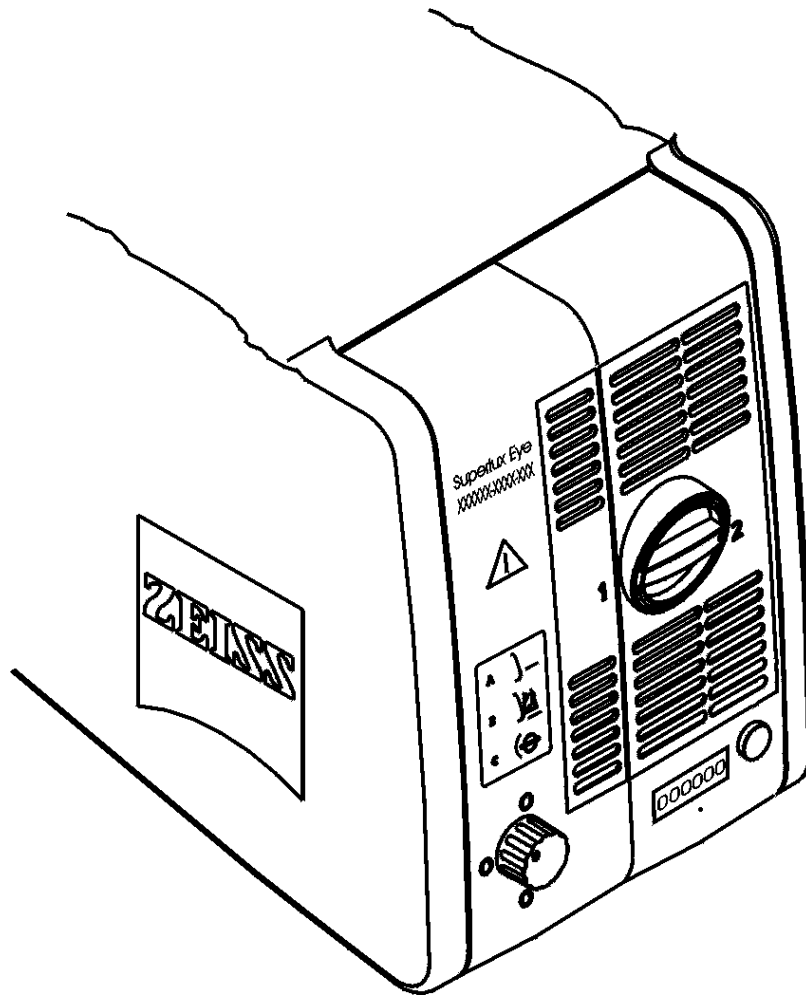
The Superlux Eye light source is equipped with a xenon lamp, a blue barrier filter (retina protection filter) and an optionally selectable filter. The xenon lamp generates light whose spectrum resembles that of natural daylight. Regardless of the brightness setting, the color temperature of the light always remains the same. This permits normal daylight film without any additional conversion filters to be used for photographic documentation. The second xenon lamp is used as a backup lamp which has to be swung into the illumination beam path when the first xenon lamp fails.

- The standard version of the Superlux Eye light source is marked on the front panel by the number 304977-9011-500. In addition to the blue barrier filter (retina protection filter), this light source contains the HaMode filter which generates a light spectrum similar to that of the halogen light source.
- The Superlux Eye light source is optionally available with the 485 mm fluorescence excitation filter that makes fluorescent areas visible. This version, which is also equipped with the blue barrier filter (retina protection filter), is marked on the front panel by the number 304977-9012-500.



Note:

Do not cover the ventilation grid! For example, drapes could be covering the grid. This can lead to overheating of the lamp modules and to lamp failure.



- 1 Lamp module
- 2 Manual activation of the backup lamp
 - When the xenon lamp fails, open the lamp module as follows:
 - Press button (7). The lamp module is slightly ejected.
 - Pull out the lamp module as far as it will go.
 - Turn knob (2) through 180° until it snaps in. This moves the backup lamp into the illumination beam path.
 - Push the lamp module all the way back into the lamp housing.
 - Reset the service hour counter to "0". Use a pointed object and press it into the recess of reset button (6).



Note:

When inserting a new lamp module, make sure that knob (2) is set to "1". If the first lamp fails, you switch to the second lamp in logical sequence.

- 3 Indicator: backup lamp is in use
When the red segment in knob (2) lights up, the backup lamp is in use.

- 4 Filter selector knob
The filter selector knob has the following positions:



no filter

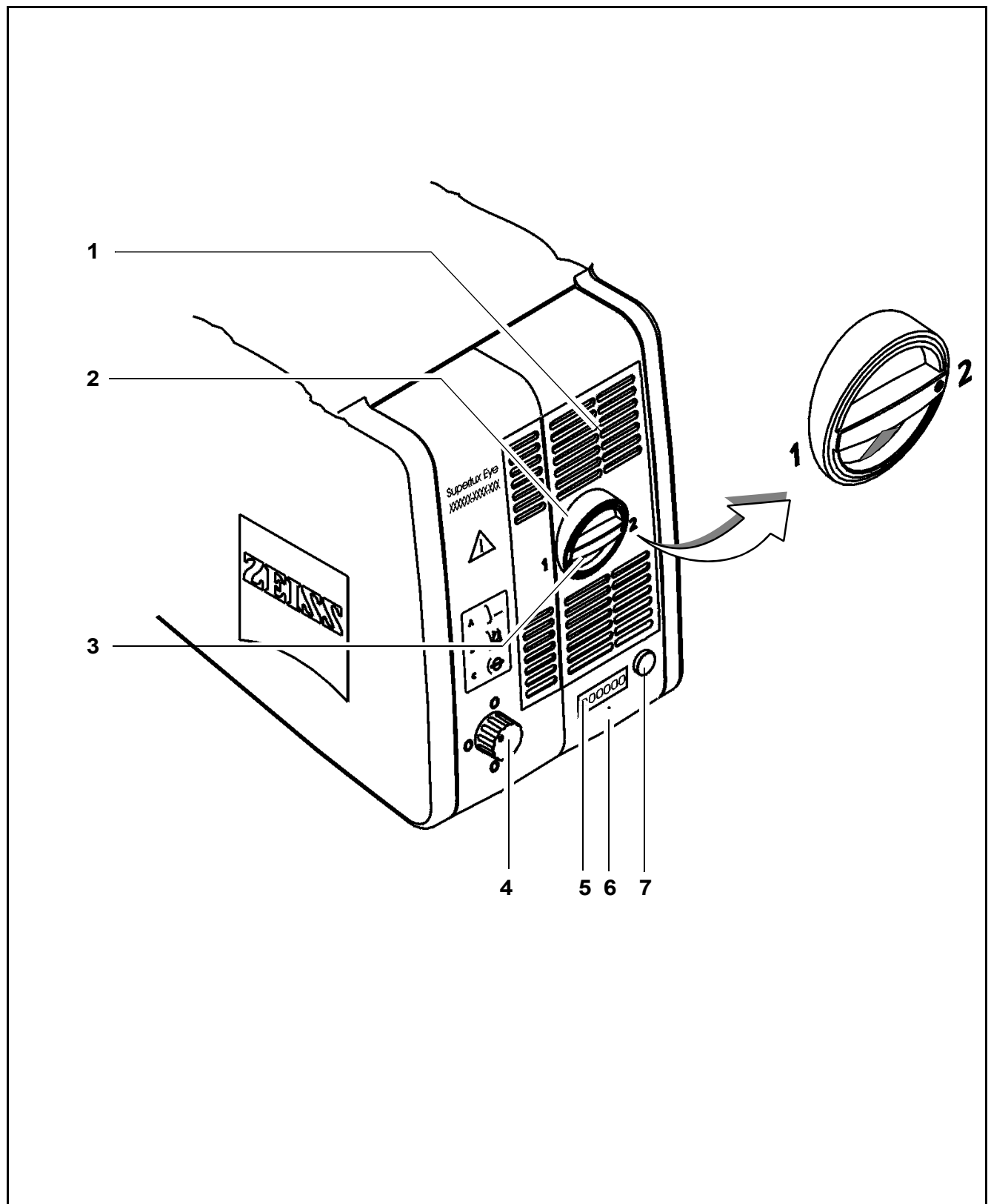


blue barrier filter (retina protection filter)



HaMode filter (standard)

485 nm fluorescence excitation filter (option)



5 Counter

The counter records the service hours of the xenon lamp in the Superlux Eye light source.

- Change the xenon lamps after about 500 hours of operation to avoid any explosion of the xenon lamps. Then reset the counter to "0" by pressing reset button (6).

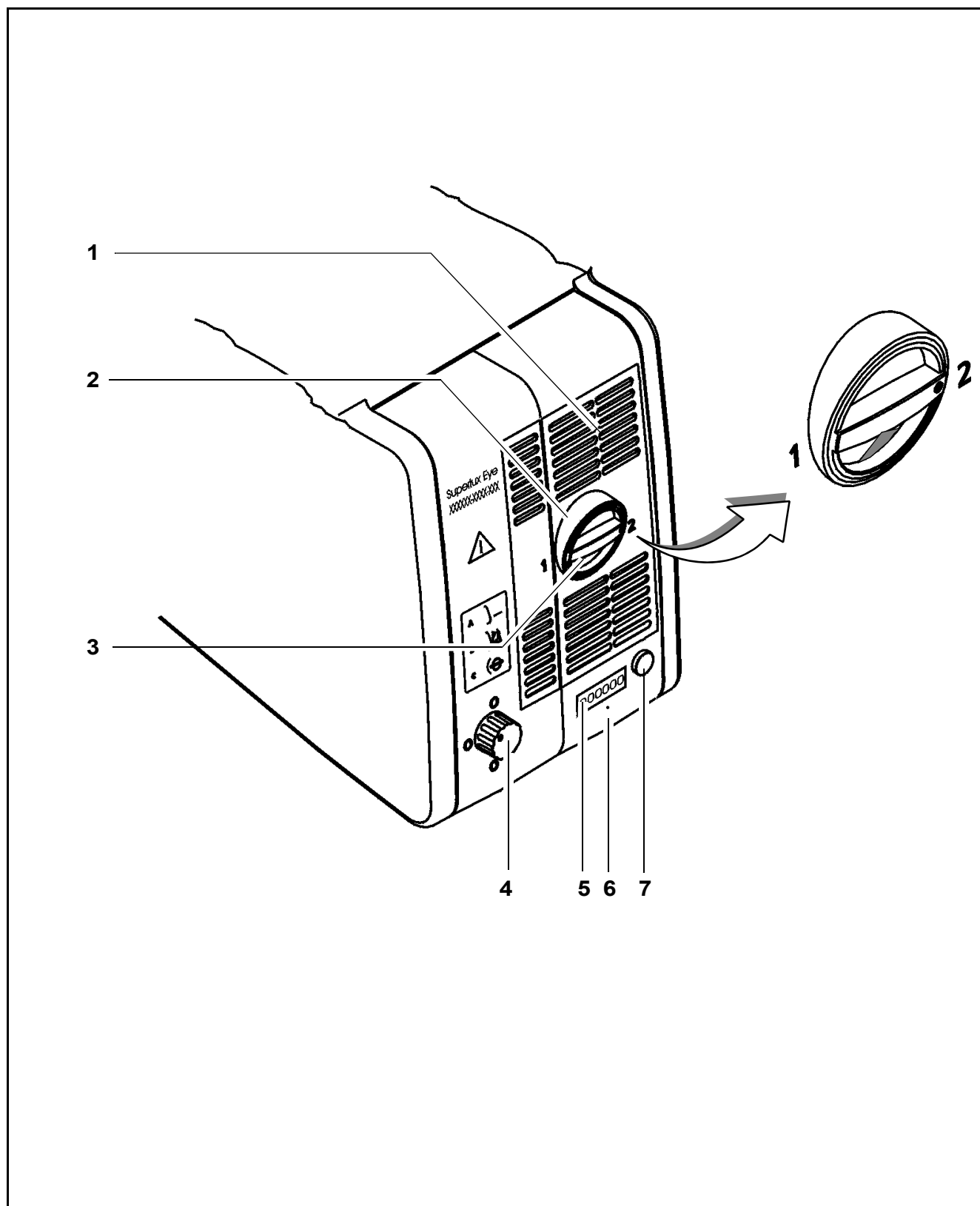
6 Reset button

The reset button resets the service hour counter to "0".

7 Opening the lamp module

When you press this button, the lamp module is slightly ejected.

- For changing the lamp, pull out the lamp module as far as it will go. Turn knob (2) through 180° until it snaps in. This moves the backup lamp into the illumination beam path.



8 Brightness control

You can adjust the brightness using the two control keys on the control panel. The brightness of the xenon lamp can also be adjusted by pressing the appropriate buttons on the foot control panel.



Warning!

Too much light intensity (brightness setting is too high) or excessive radiation exposure times may lead to retinal injury in the patient's eye.

- Adjust the illumination intensity as required for the selected type of illumination and the radiation exposure time. You will find the values recommended by Carl Zeiss in the table "Maximum radiation exposure times" on page 29.

9 Yellow indicator lamp

Lights when the lamp has failed, or if the lamp module is defective. After activation and ignition of the backup lamp, the yellow indicator lamp goes out again.




Note:


If the first lamp has failed and the backup lamp is in use, make sure to have a backup lamp module ready at hand as a precaution.

10 Green indicator lamp

Lights when the light source has been switched on.

11 Selector:

-  The light source is off.

-  The light source is on.



The light source can be switched on/off on the **left-hand side** of the foot control panel.

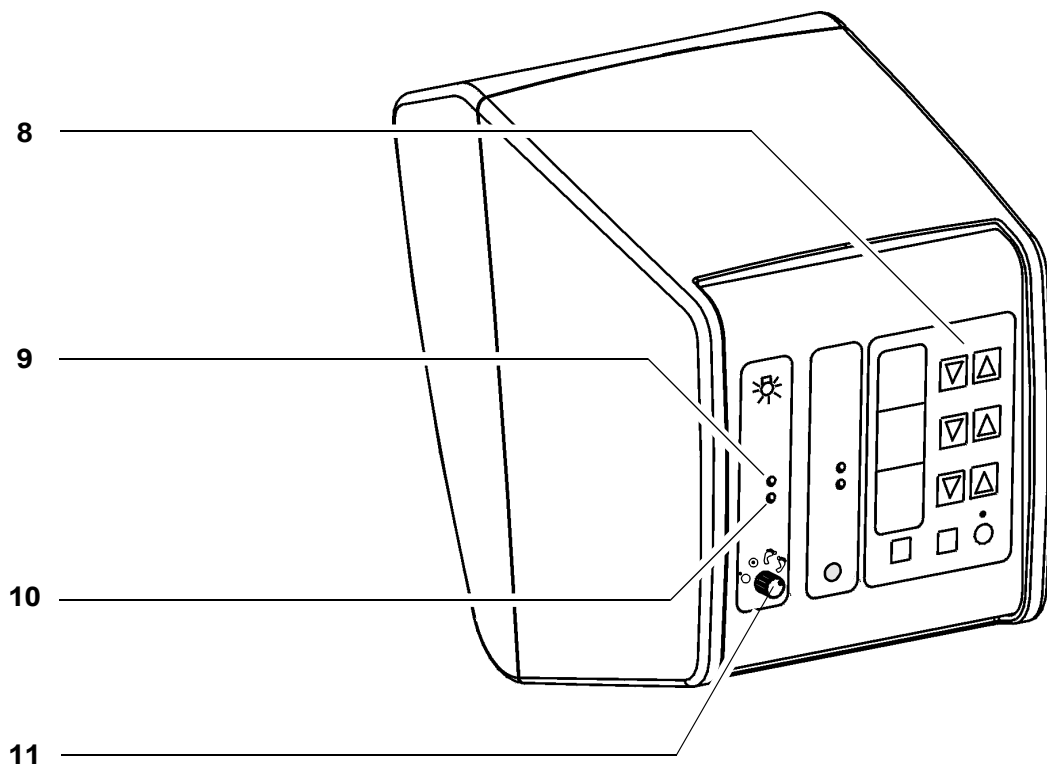


The light source can be switched on/off on the **right-hand side** of the foot control panel.



Note:

You can adjust the selector in such a way that you can switch the light source on/off on the right-hand and left-hand sides of the foot control panel.



Superlux Eye with integrated halogen light source (option)



Warning!

The xenon lamp has a limited service life of 500 h.

If used beyond its maximum service life, the xenon lamp may explode.

- Replace the xenon lamp in good time.
- Reset the service hour counter to "0" after replacing the lamp.

Please observe the procedure described on page 80.

Superlux Eye with an integrated halogen light source is a combination of the two light sources described above. Like the Superlux Eye light source, this combination is also available with two filter versions: the HaMode filter and the 485 nm fluorescence excitation filter.



Ventilation grid

Do not cover the ventilation grid! For example, drapes could be covering the grid. This can lead to overheating of the lamp modules and to lamp failure.

1 Filter selector knob

The filter selector knob has the following positions:



no filter



blue barrier filter (retina protection filter)



HaMode filter (standard)



485 nm fluorescence excitation filter (option)

2 Counter

The counter records the service hours of the xenon light source. Change the xenon lamps after about 500 hours of operation to avoid any explosion of the xenon lamps, and reset the counter to "0". Use a pointed object and press it into the recess of reset button (3).

3 Reset button

The reset button resets the service hour counter to "0".

4 Opening the Superlux Eye lamp module

When you press this button, the lamp module is slightly ejected. For changing the lamp, pull out the lamp module as far as it will go. Turn knob (5) through 180° until it snaps in. This moves the backup lamp into the illumination beam path.

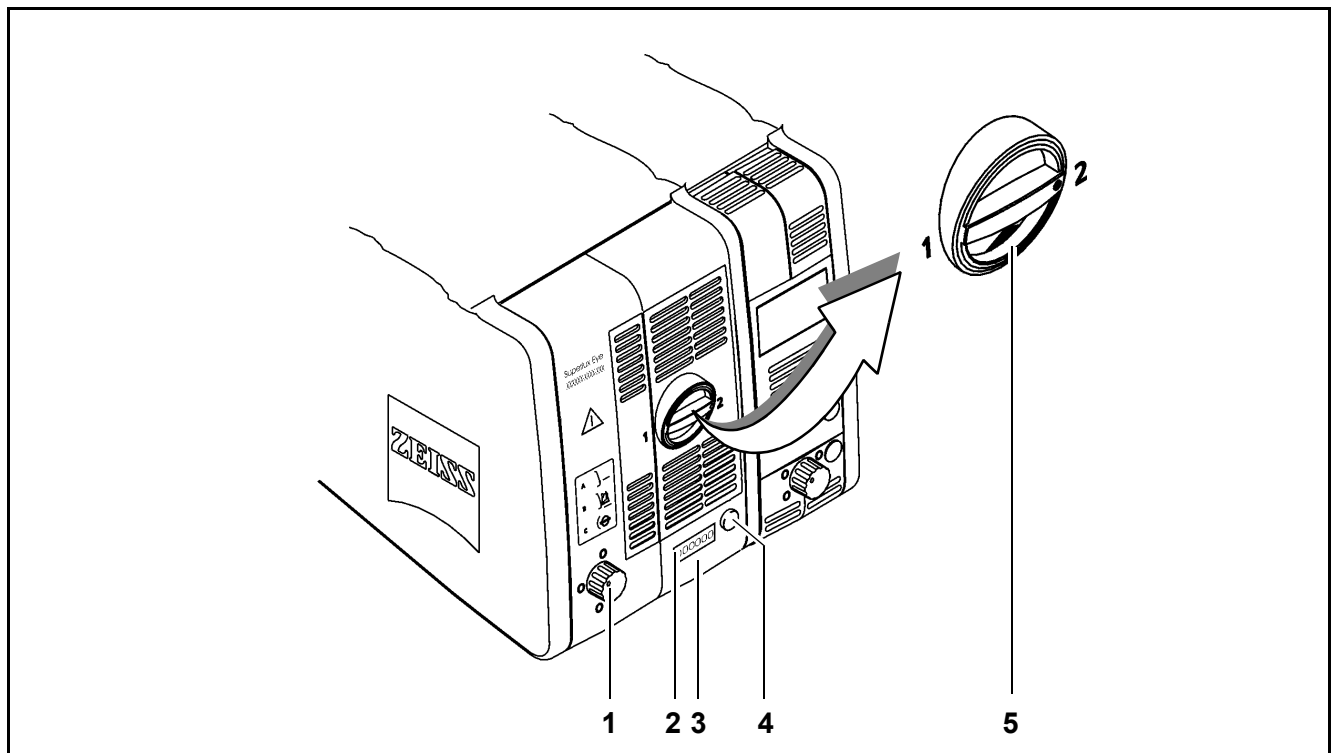
5 Manual activation of the Superlux Eye backup lamp

When the xenon lamp fails, open the lamp module as follows: Press button (4). The lamp module is slightly ejected. Pull out the lamp module as far as it will go. Turn knob (5) through 180° until it snaps in. This moves the backup lamp into the illumination beam path. Push the lamp module all the way back into the lamp housing. Use a pointed object and press it into the recess of reset button (3).



Note:

When inserting a new lamp module, make sure that knob (2) is set to "1". If the first lamp fails, you switch to the second lamp in logical sequence.



6 Flap

The flap is the mechanical indicator for the operating status of the halogen lamps.

- When the flap is closed, the main lamp is operative (green light (15) is on).
- When the flap is open, the main lamp has failed. The backup lamp is used (yellow light (14) is on).

7 Filter selector knob for the additional integrated halogen light source
The filter knob has four positions:

no filter



blue barrier filter (retina protection filter): when operating on the eye, always use this filter to protect the patient's eye against unnecessary radiation (retinal injury).



KK 40 filter:

to increase the color temperature



empty filter position

8 Opening the lamp module of the additional integrated halogen light source

When you press this button, the lamp module is slightly ejected. Pull out the lamp module all the way for lamp change.

9 Manual activation of the halogen backup lamp

If the automatic activation system fails, press this button to switch on the backup lamp.

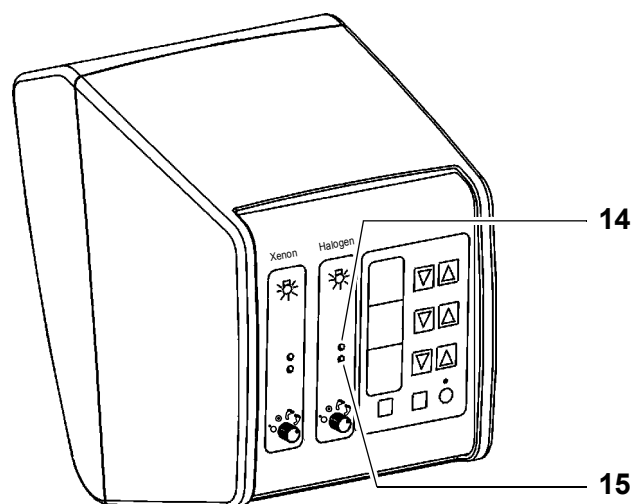
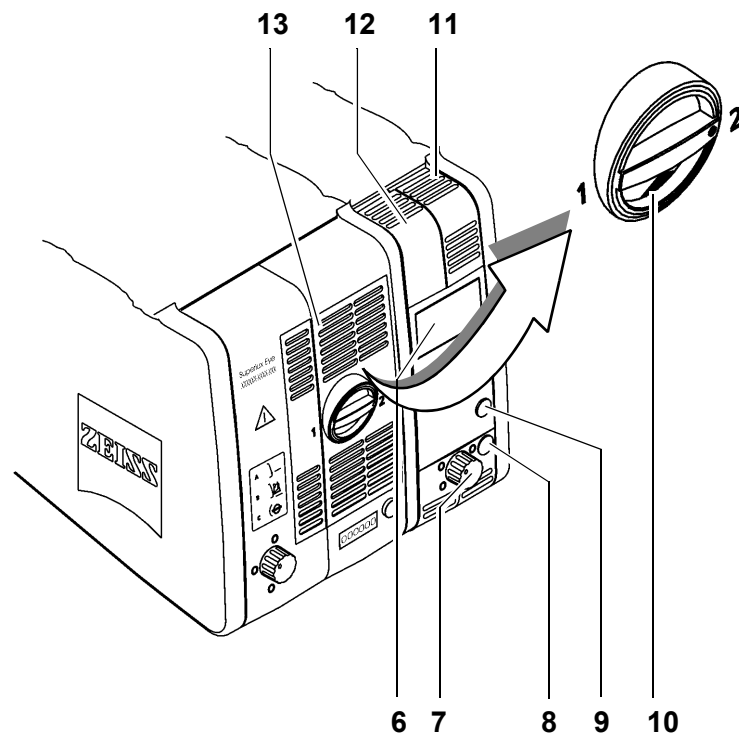
10 Indicator: Superlux Eye backup lamp is in use

When the red segment in the knob lights up, the backup lamp is in use.

11 Ventilation grid for the additional integrated halogen light source

Do not cover the ventilation grid! For example, drapes could be covering the grid. This can lead to overheating of the lamp modules and to lamp failure.

**12 Lamp module of the additional integrated halogen light source****13 Superlux Eye lamp module**




14 Yellow indicator lamp


- Lights when the main lamp has failed. The backup lamp is on.
- Blinks when the backup lamp has failed.


15 Green indicator lamp


Lights when the respective light source has been switched on.

16 Selector:

 The light source is off.

 The light source is on.

 The light source can be switched on/off on the **left-hand side** of the foot control panel.

 The light source can be switched on/off on the **right-hand side** of the foot control panel.

**Note:**

If two lamp housings are available, you can set the selector switch in such a way

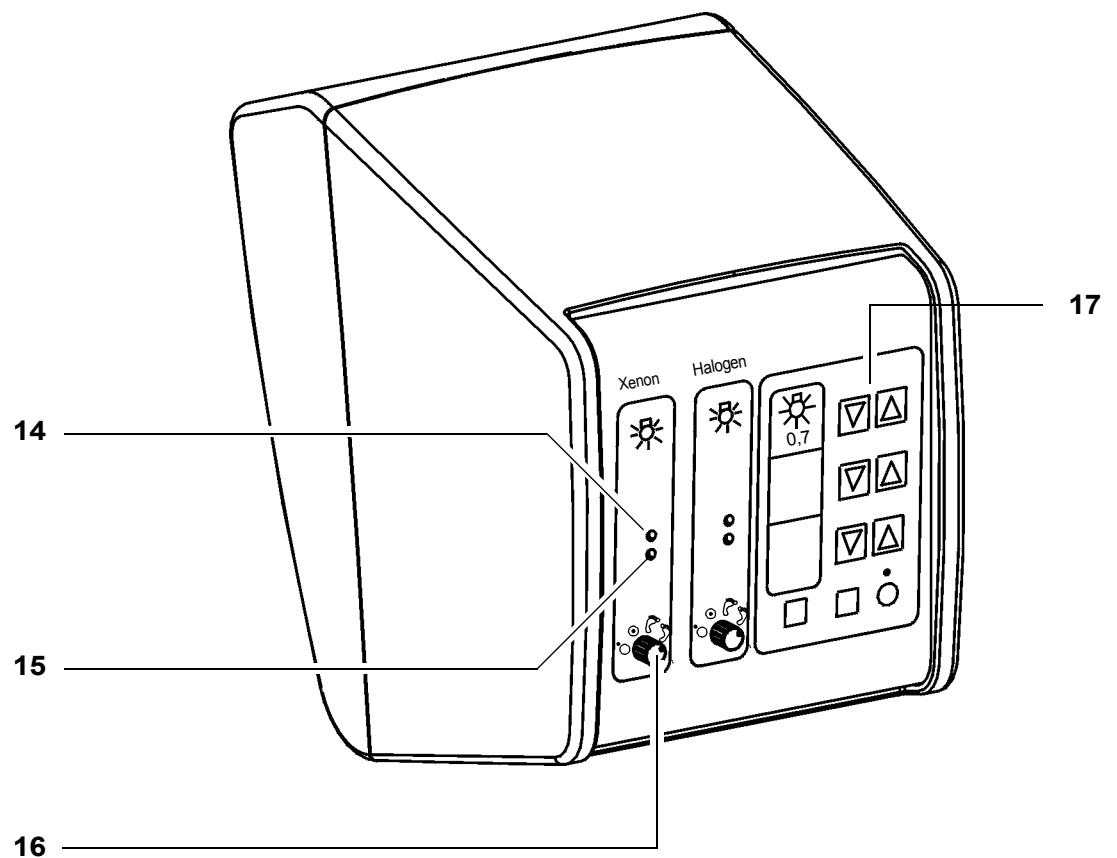
- that one light source each can be switched on/off on the left-hand and right-hand side of the foot control panel,
- or that both light sources can be switched on/off on the left-hand or right-hand side of the foot control panel.

17 Brightness control

You can adjust the brightness using the two control keys on the control panel.

**Note:**

If the suspension system has two lamp housings, you can also adjust the brightness of lamp 1 by pressing the appropriate button on the foot control panel.



Identical components of the suspension systems

Suspension arm

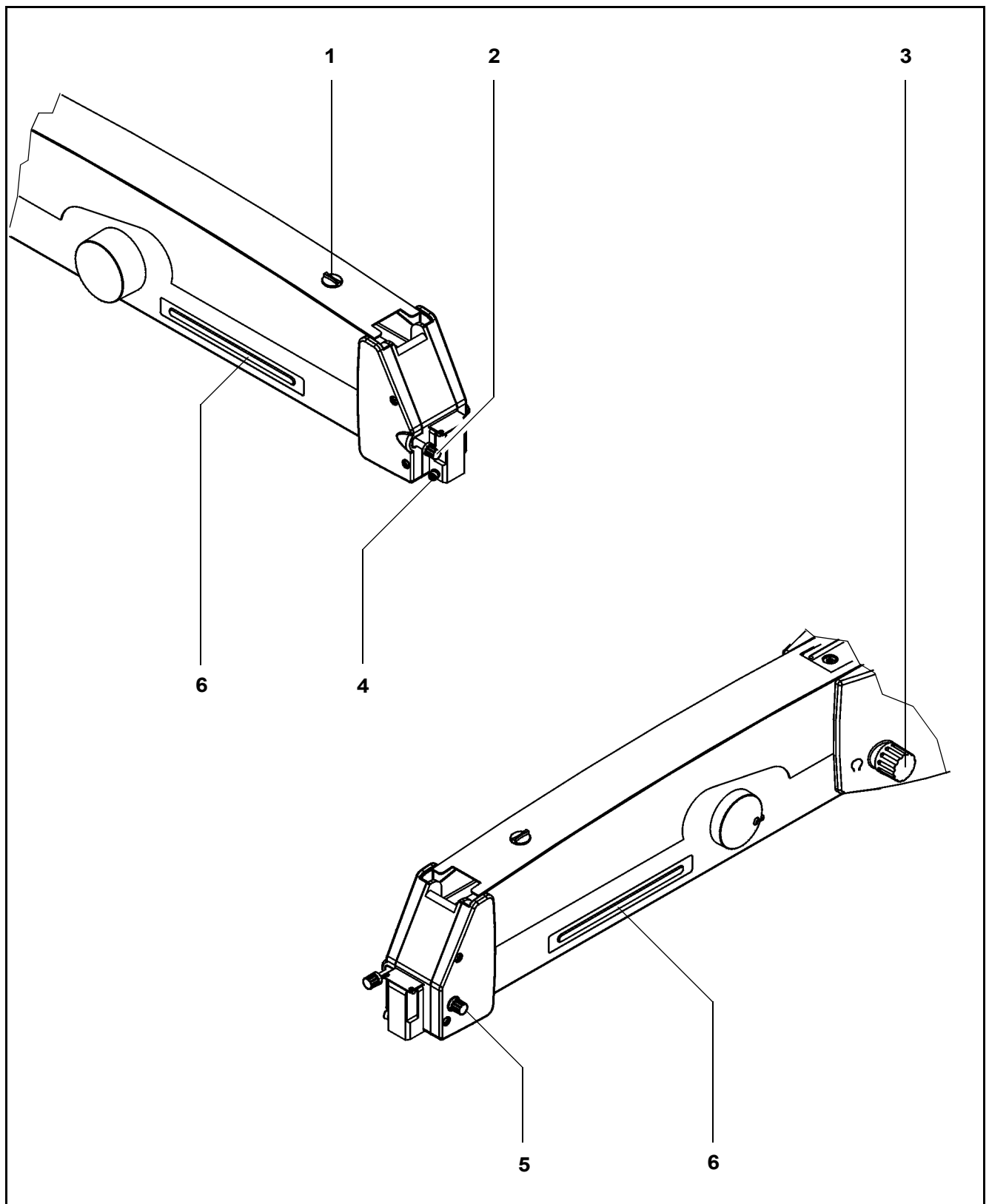
- 1 Lock of the cable duct
 - For opening, turn a quarter turn clockwise or counterclockwise.
 - For closing, press down and turn a quarter turn clockwise or counterclockwise.
- 2 Adjustment screw for limiting downward movement

Use this screw to set the minimum vertical working distance from the surgical field. Bring the surgical microscope into its working position. Turn the adjustment screw for limiting downward movement clockwise as far as it will go. Adjust the downward movement limitation before each surgical procedure.
- 3 Balance setting screw

After mounting the surgical microscope including all accessories, adjust the balance setting of the suspension arm using this screw. Balance setting is described in detail in chapter “Operation”.
- 4 Securing screw
for securing the OPMI® coupling.
- 5 Locking knob
for locking the suspension arm in a horizontal position for mounting the surgical microscope. This prevents the suspension arm from uncontrollably moving upward when insufficient weight is attached.
- 6 Release bar
Allows non-sterile persons to release the magnetic brakes of the suspension system.

Magnetic brake release buttons

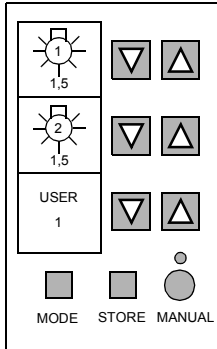
The magnetic brake release buttons are located on the surgical microscope. For as long as you press one of these buttons, you can move the articulated arm in all directions. When you let go of the button, the magnetic brakes will lock all axes in position at the same time.



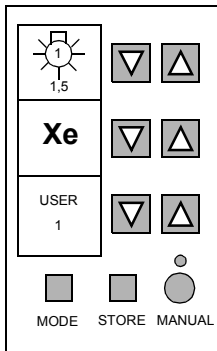
Display field with control keys

Basic mode

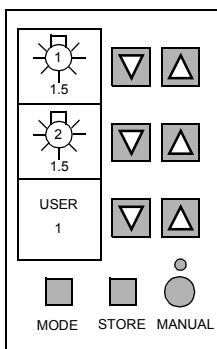
Halogen



Xenon



Xenon with halogen (option)



The display and control panel is integrated in the control unit.

The surgical microscope on the suspension system can be controlled either manually or electronically. The control software required for electronic control is installed in the electronics box of the suspension system. You operate the software via the control and display panel, where you can read off and reconfigure the current settings.

The control and display panel is structured as follows:

- Three display fields (LCD) with the associated keys "▽" and "△".

One row of keys comprising the MODE, STORE and MANUAL keys, and a yellow LED above the MANUAL key.

User interface

The user interface of the suspension system comprises three display fields and keys located beside and below them.

A pair of keys "▽" and "△" has been assigned to every display field for making the appropriate settings.

The control functions have been combined in several modes (menu pages). The basic mode is always displayed in the normal operating status.

The following is displayed in the basic mode:

- the current lamp brightness of lamp 1 (halogen) in the upper display field,
- the current lamp brightness of lamp 2 (halogen) in the middle display field,
- the current lamp brightness of lamp 1 (xenon) in the upper display field,
- Xe for xenon in the middle display field,
- the current user ID in the lower display field.

Note:

For the Superlux Eye light source with additional, integrated halogen illumination (option), the lamps are numbered as follows:

Lamp 1: xenon

Lamp 2: halogen

Keys

Three keys and an LED are provided below the displays.

Use the "MODE", "STORE" and "MANUAL" keys to select the different control functions (modes).

"MODE" key and "STORE" key

The "MODE" and "STORE" keys permit you to access the different modes of the user interface. For details, please see the chapter "Operation".

"STORE" key

You use the "STORE" key, for example, to save the current focus and zoom settings for OPMI® Vario on the suspension system.

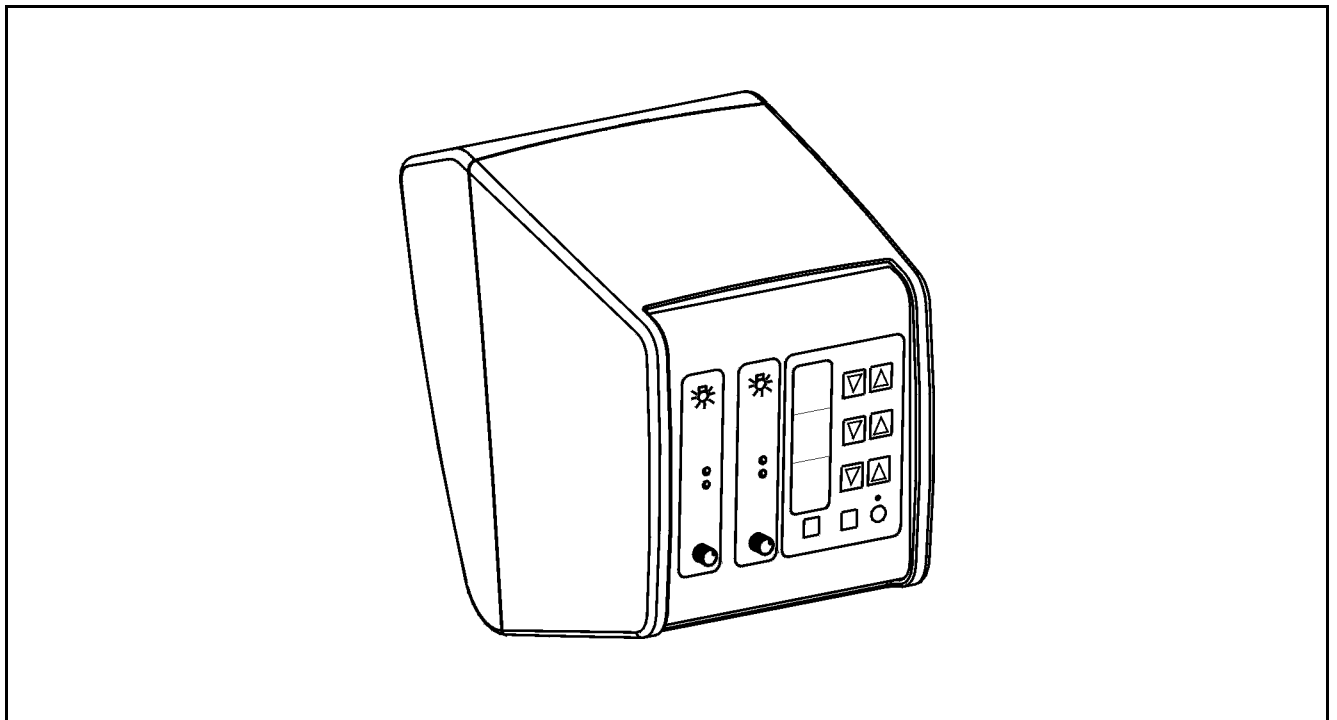
"MANUAL" key

The "MANUAL" key permits you to switch to manual operation. For details, please see the chapter "Operation".

Yellow LED above the "MANUAL" key

The yellow LED is lit when you have switched to the manual mode.

The illustration shows the control and display panel of the suspension system with two halogen light sources (option).



S88 floor stand

Intended use

The floor stand is a suspension system for Zeiss surgical microscopes. It is used to power and control the motorized functions of the surgical microscope. The hallmarks of the floor stand are its superb mobility and easy operation. Four steerable casters on the stand base permit easy positioning in the OR. The motorized functions of the surgical microscope can be activated using a foot control panel.

Further useful functions include, for example:

- magnetic brakes for almost effortless positioning,
- fully automatic lamp change in the halogen light source,
- brightness control via a foot control panel,
- reset of X-Y coupling, focus and zoom,
- user-defined basic settings for a maximum of nine users:
 - speeds for focus, zoom and X-Y coupling
 - and configurable buttons on the foot control panel for focus memory, XY inversion, camera release, swinging SDI in/out, triggering an AUX signal.



Warning!

When using the Superlux Eye light source, only operate the system with special xenon lamps approved by Carl Zeiss for ophthalmic surgery. If any other than Carl Zeiss-approved xenon lamps are used, there is the risk of severe injury to the patient's eye.

Description of components

The floor stand comprises an articulated arm, a stand column and a stand base. The articulated arm comprises a carrier arm and a suspension arm. The carrier arm contains the control unit with all electrical supply systems required for the control of a motorized surgical microscope. These motorized functions can be activated using a foot control panel.

The suspension arm permits almost effortless positioning of the surgical microscope. The spring force of the suspension arm can be varied in a range from 8 to 20 kg, permitting reliable balancing of the microscope even with heavy accessory equipment. The downward movement of the suspension arm can be limited as required.

A maneuvering handle attached to the stand column is used to move the stand and to attach the foot control panel. The stand column is provided on its left and right with cable supports for winding up cables before the unit is relocated. Four steerable casters on the stand base permit easy positioning near the operating table. The stand base has been designed in such a way that high stability is ensured even with unfavorable loading of the stand. A locking pedal permits the floor stand to be quickly and reliably locked in position.

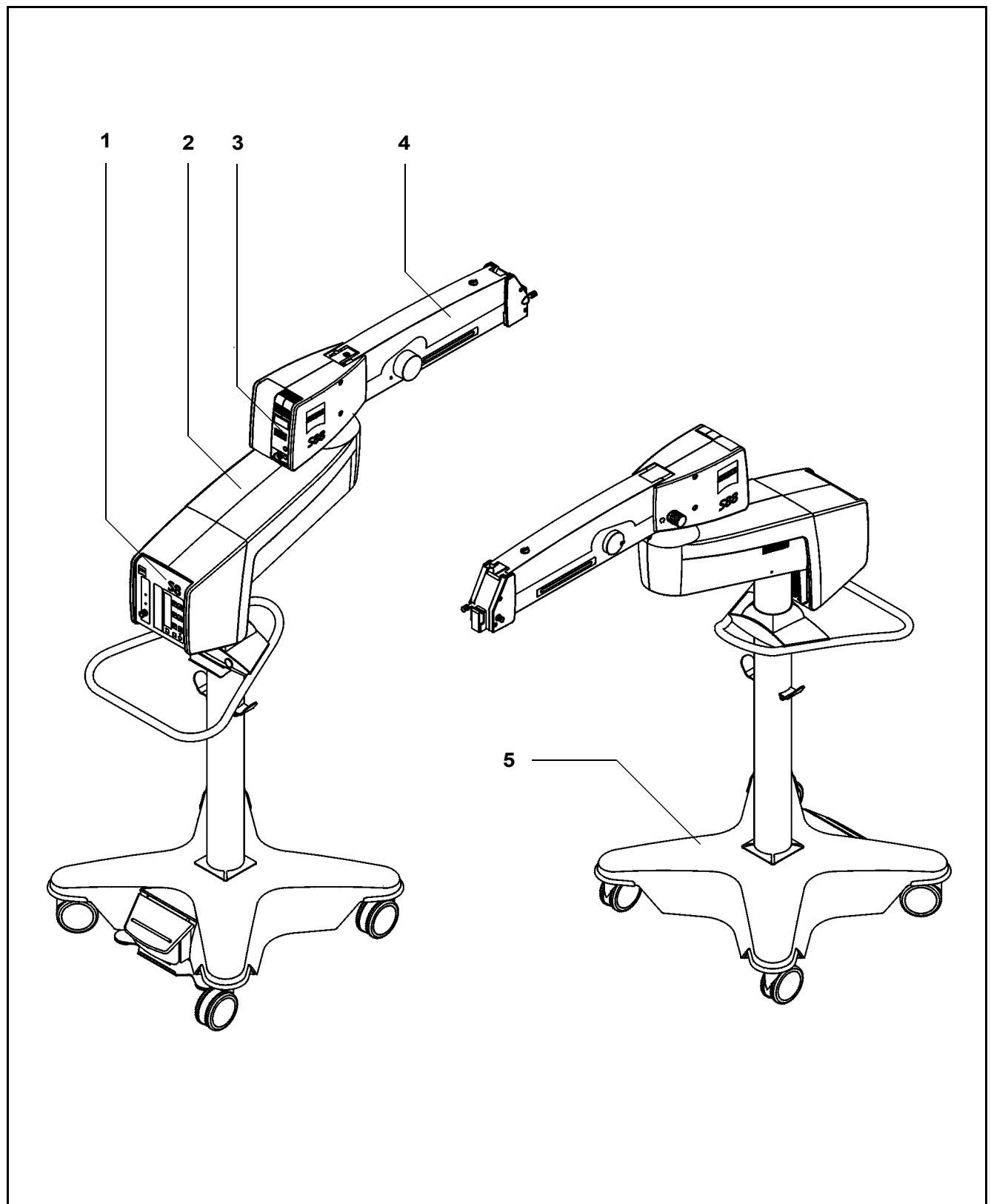


Caution:

As the stand is very easy to maneuver, there is a tendency to underestimate its considerable weight. Therefore, move the stand slowly and carefully!

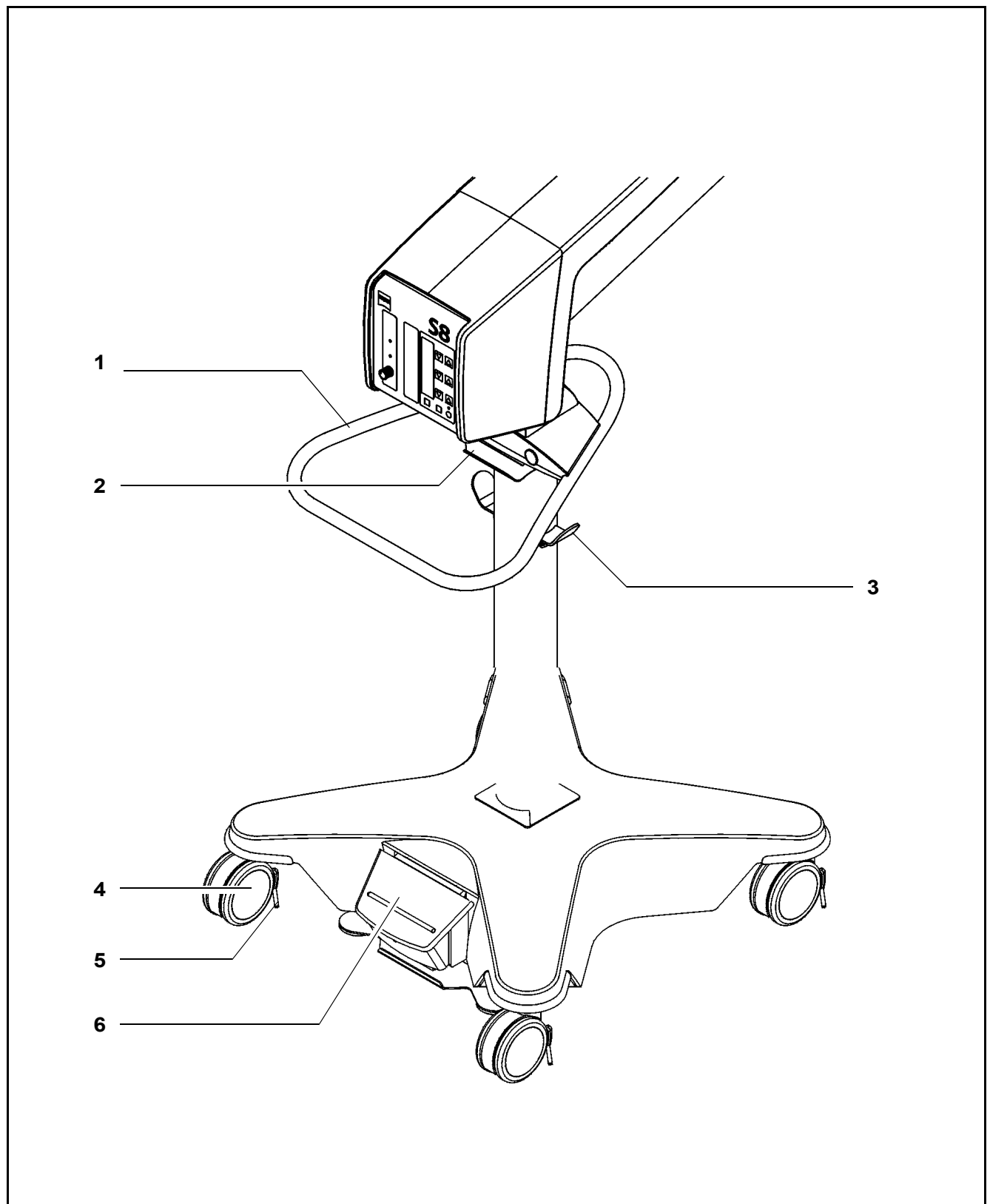
Design

- 1 Control unit
- 2 Carrier arm
- 3 Light source, see page 78
- 4 Suspension arm
- 5 Stand base



Stand base with column

- 1** Maneuvering handle
for moving the stand.
- 2** Support
for hanging up the foot control panel during transport.
- 3** Cable support (2x)
for winding up the power cord and the cable of the foot control panel.
- 4** Cable deflector
protects the cables lying on the floor from damage caused by rolling over them with the stand base.
- 5** Locking pedal
Press once to lock the stand in position.
Press a second time to release the locking pedal.
- 6** Steerable casters
The four steerable casters on the stand base permit easy positioning in the OR.



Connection panel

- 1 Remote socket
for triggering an AUX signal, e.g. to switch on/off an external device operating at max. 24V/0.5A.
- 2 Connector for switching component
Possibility of connecting a foot control panel or operating chair with an appropriate footswitch.
- 3 Potential equalization connector
- 4 Indicator window for rated voltage
The voltage shown here must correspond to the rated line voltage provided on the site of installation. You can adjust the sliding switch using a suitable tool.



Warning!

Please observe the maximum current consumption of two power outlets (5) and (6). Only connect medical devices approved by us to outlets (5) and (6). When using other devices, make sure that safety is guaranteed regarding admissible ground leakage currents. The admissible limit value of the ground leakage current present in the suspension system's power cord must not exceed 500 μ A in compliance with EN60601-1/IEC 60601-1. CSA/US certification in compliance with UL 60601-1 only allows a maximum ground leakage current of 300 μ A.



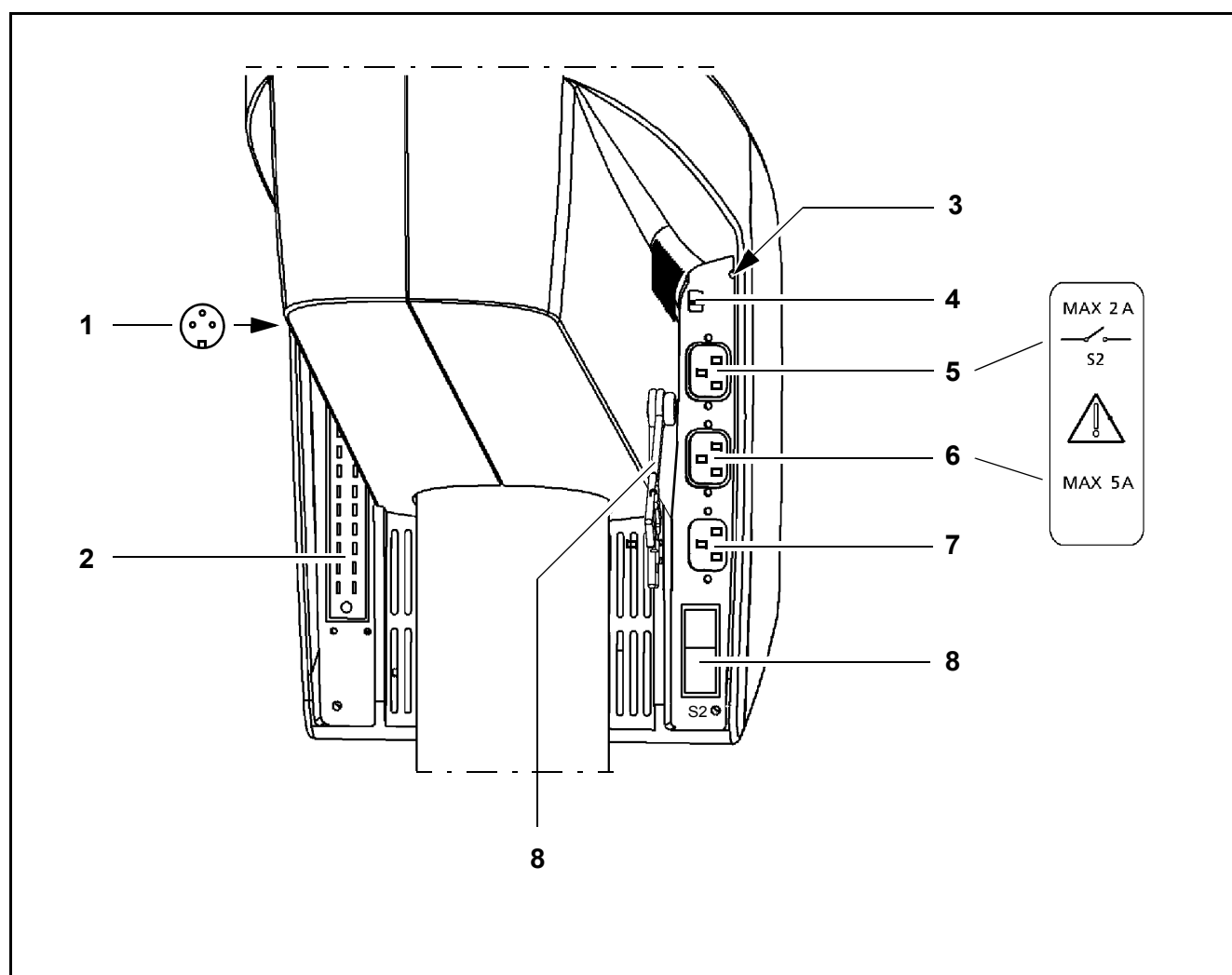
- 5 Power outlet
for medical devices with a current consumption of max. 2 A.

Note:

The current of this power outlet is switched on/off using the S2 power switch (7).

- 6 Power outlet socket
for medical devices with a maximum current consumption of 5 A.
- 7 Power inlet socket
- 8 Power switch S2
When the suspension system is on, the green indicator light in the switch is lit.
- 9 Strain relief device
The strain relief device prevents inadvertent unplugging of the following electrical connections:
 - power cable,

- connecting cable for foot control panel or operating chair with appropriate footswitch.



Instrument tray (option)

The S88 floor stand can be equipped or retrofitted with an instrument tray (1). In the case of retrofitting, our service staff or an authorized person will install the instrument tray on your suspension system.

The instrument tray (1) can carry a maximum of 13 kg. It is designed for mounting the Zeiss instruments VISULAS 532s or MediLive™ Trio Eye:



- The four receptacles (2) on the instrument tray are intended for VISULAS 532s. The VISULAS 532s is secured in position with its feet in these four receptacles.

Caution:

Protect the VISULAS 532s from being pulled accidentally downwards with the aid of the strap provided.

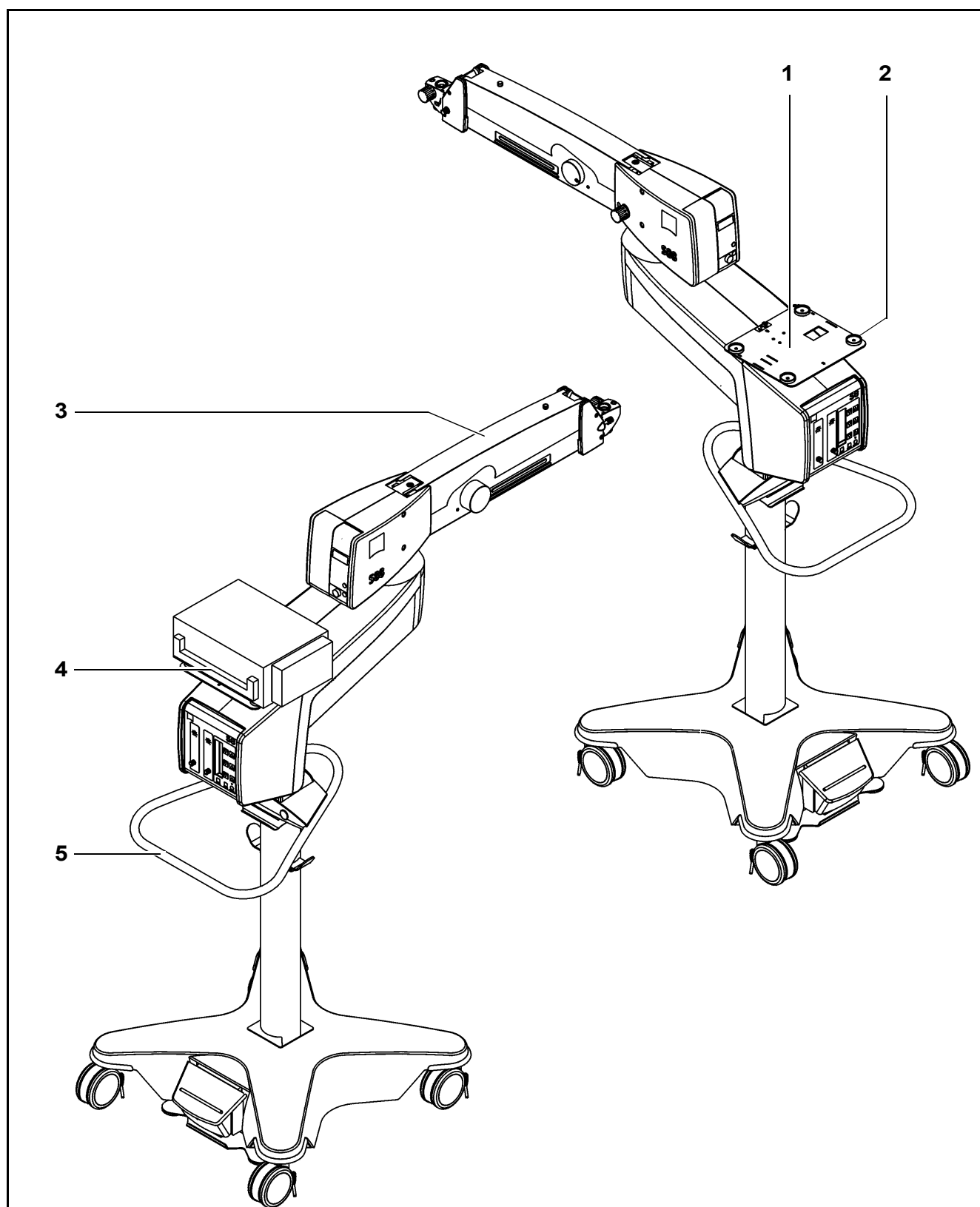
- The four receptacles (2) are not required for the MediLive Trio. The MediLive Trio is attached to the instrument tray with the aid of two stud bolts.

A second MediLive Trio or other accessory equipment can be mounted on the instrument tray using the strap provided. Please note that the maximum load bearing capacity of the instrument tray is 13 kg.



Warning!

- Make sure that the accessory equipment is positioned as securely as possible on the instrument tray. Attach the second and, if required, further accessory equipment using the strap provided.
- Do not place a load of more than 13 kg on instrument tray (1).
- Remember there is a risk of collision and crushing when suspension arm (3) is folded to its moving position. A "Risk of crushing" warning label is therefore attached on the left and right of suspension arm (3).
- Please read the relevant user manual before starting up the accessory equipment.
- If you have a VISULAS 532s on the instrument tray:
 - Before start-up, familiarize yourself in particular with the safety regulations (see instruction manual) with regard to "the hazards of laser radiation".
 - Never under any circumstances pull carrying handle (4) in order to move the S88 floor stand. Always use only handle (5) to move the S88 floor stand.



Video monitor (option)

The S88 floor stand can be equipped or retrofitted with a TFT monitor (1). In the case of retrofitting, our service staff or an authorized person will install the TFT monitor on your suspension system.

The TFT monitor features a 15" screen and permits the scrub nurse and other OR staff to follow the surgical procedure. For optimum viewing, the TFT monitor can be precisely positioned using flexible arm (2).



Warning!

Risk of injury due to lowering of the TFT monitor!

- Ageing processes may lead to the loss of gas in the gas pressure spring of the monitor's suspension arm, causing the TFT monitor to move downward of its own accord.
- Compensate for the loss of gas by readjusting the gas pressure spring as described on page 236.

If the TFT monitor continues to move downward, the gas pressure spring is defective.

- Notify our service representative.



Warning!

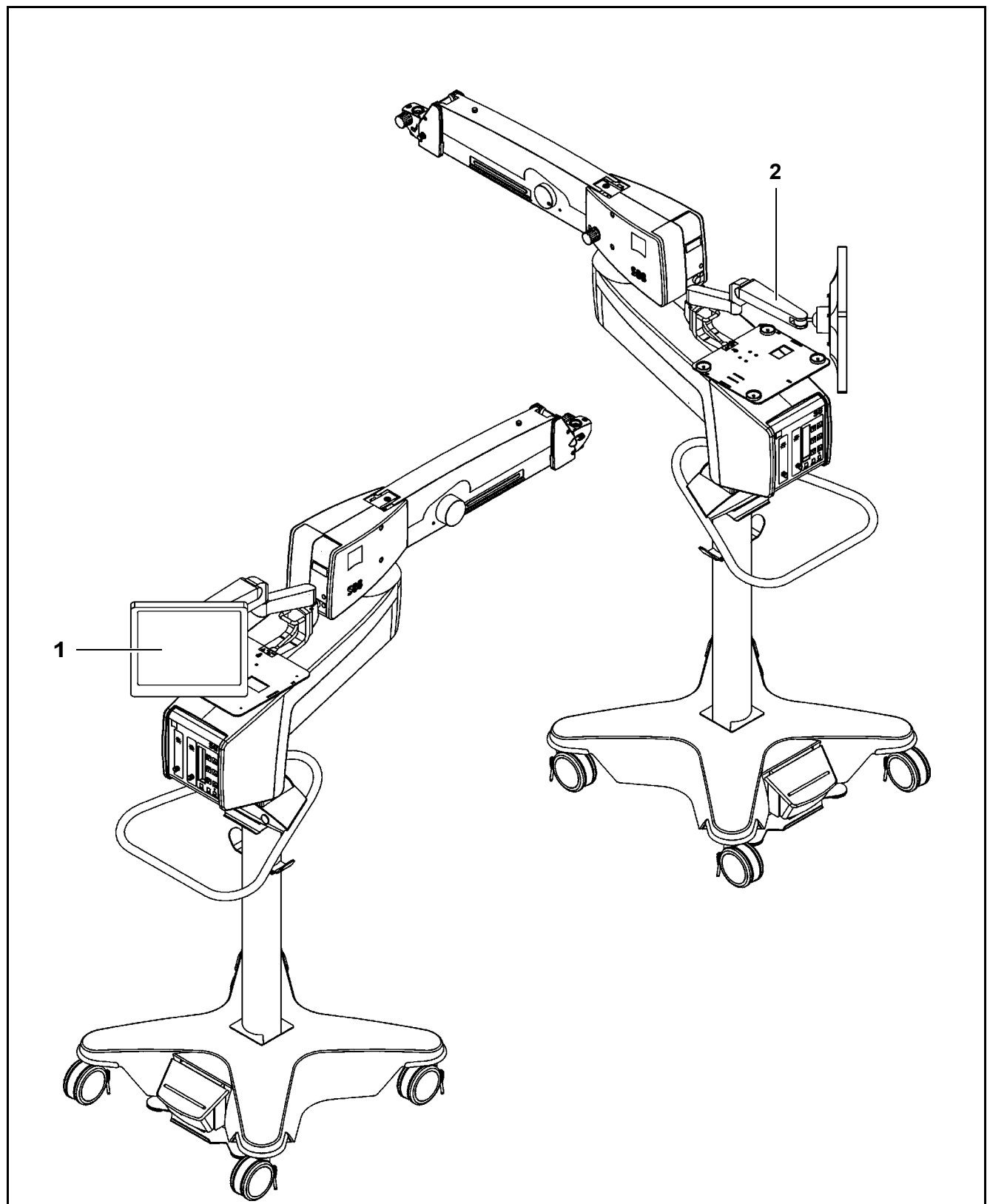
Do not use the stored video sequences, video clips (cut sequences) and single images for diagnostic purposes, as the video cameras and the monitor have not been calibrated. The visualized images may therefore include deviations in scale, color and shape.

This applies in particular if the sequences, clips or images are viewed on a monitor outside the OR, as the transmission to a different monitor may lead to changes in the display.



Note:

The background illumination of the LCD display has a limited service life. If you notice that the display is getting darker or starts to flicker, contact your Zeiss dealer.



Components

The principal component of the TFT monitor is the 15" screen which delivers flawless, sharp images even at low frame rates of 50 Hz.

The connectors and controls are located under cable cover (2) on the back of the TFT monitor. To access the connectors and controls, proceed as follows:

- Remove two screws (3) from cable cover (2) by turning them counter-clockwise.
- Remove cable cover (2) by pushing it upward.

Controls

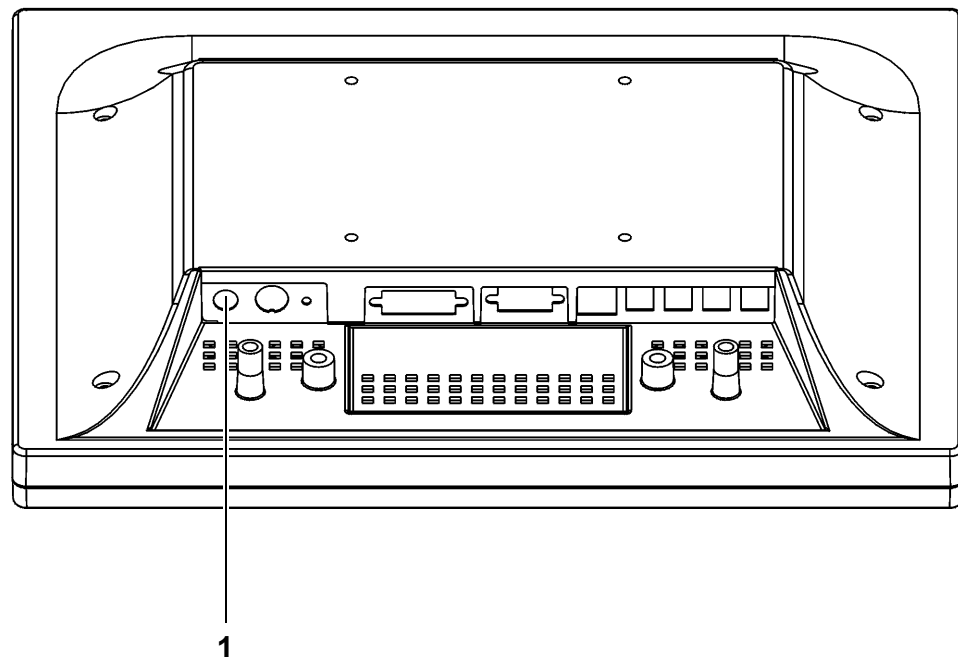
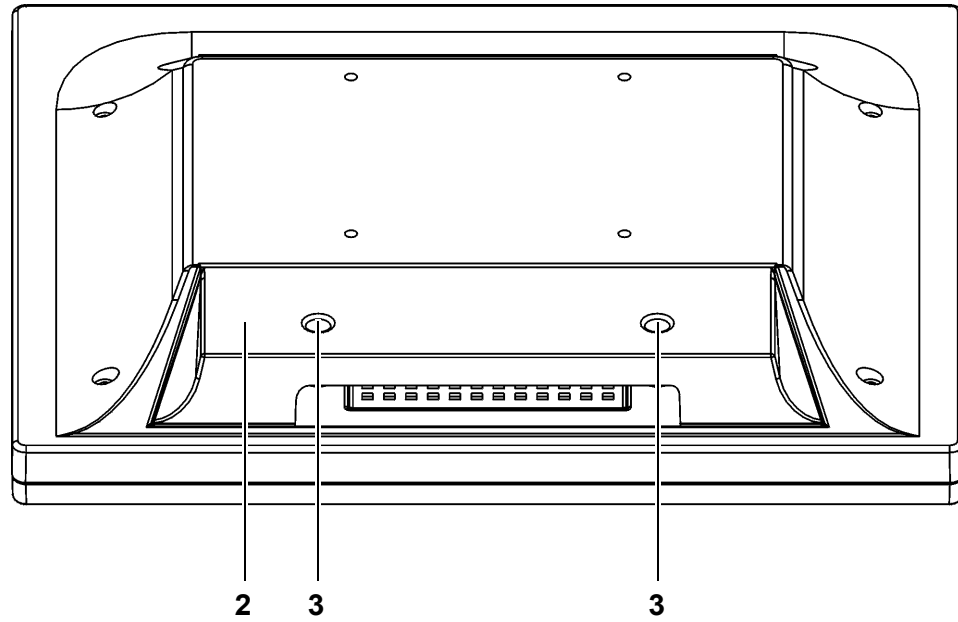
1 Auto Adjust button

The Auto Adjust function permits automatic image adjustment of the TFT monitor to obtain a sharp, optimally positioned image. Perform the automatic adjustment when initially starting up the TFT monitor or after making any changes to the system.



Note:

- The Auto Adjust function can only be executed if a VGA signal source is connected.
- Always use a normal camera image for automatic image adjustment. Do not use the test image which is displayed directly after power-on or when no camera head is connected.



Connector panel

- 2 Power supply
for power and voltage supply of the device.



Caution:

Only operate the device with the power cable included in the delivery package.

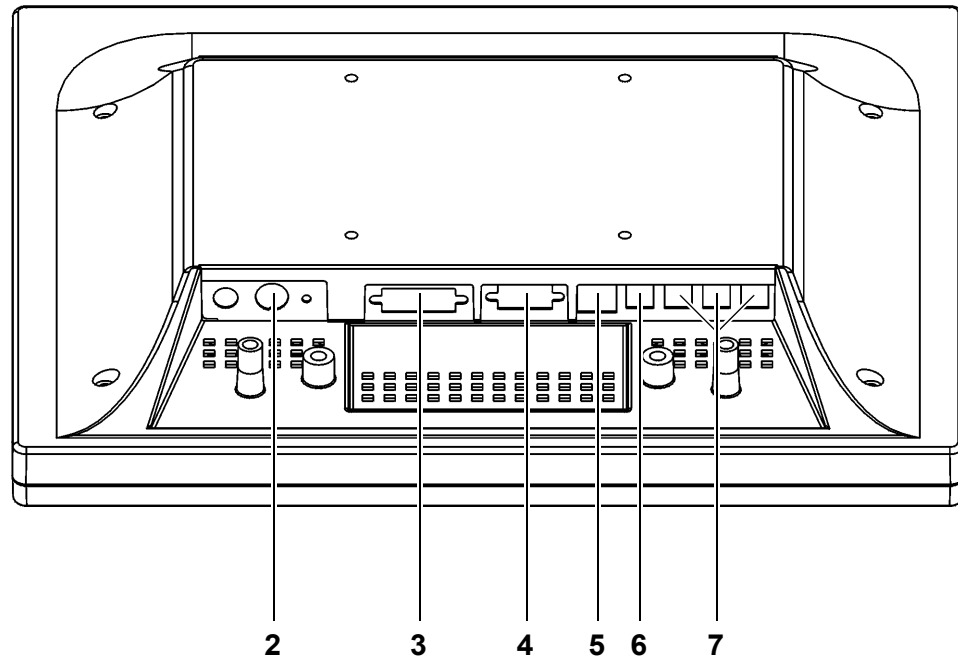
- 3 DVI connector
DVI stands for Digital Video Interface and is the latest technology for digital data transmission. The cable length for this connector must not exceed 4.5 m.



Note:

We recommend the DVI connector for the connection of a camera, as it delivers optimum image quality with minimum flicker. The DVI cable is included in the delivery package.

- 4 VGA connector
VGA stands for Video Graphics Array and is an analog interface for video data transmission between graphics cards and display devices.
- 5 S-Video connector
S-Video - also known as separate video or Y/C - is an analog interface that transmits brightness and color information as separate signals. This standard provides higher video image quality than Composite Video. The maximum cable length for this connector should not exceed 10 m. For longer cables, please use the Composite Video connector.
- 6 Composite Video connector (1x cinch)
This is an analog interface that transmits the composite video signal via a single channel (yellow cinch connector). This connector is particularly suitable for transmitting video signals over long distances.
- 7 Component connector (3x cinch)
This is an analog interface that transmits the component video signal via three channels (red, yellow, green cinch connector). Each channel transmits one of the primary colors.



Powering on the TFT monitor

To facilitate the operation of the TFT monitor, it is automatically activated when the suspension system is switched on.

During the power-on process, the TFT monitor executes a power-on sequence in which the signals on the connectors (DVI, VGA, S-Video, Composite and Component) are checked. After detection of the signal available, the correct screen resolution and frame rate are set automatically.



Note:

If a signal source is present at the VGA connector, the image settings can be optimized using the Auto Adjust function as described on page 114.

Aligning the video monitor

The best visualization is obtained when you are looking straight at the screen of the TFT monitor.

- Swivel the monitor's carrier arm (1) and suspension arm (2) into the horizontal position required.



Caution:

Take care not to damage the video cable!

Do not swivel the suspension arm beyond $\pm 120^\circ$.

- Tilt the suspension arm (2) upward or downward until the required height has been reached.
- Hold the upper corners of the TFT monitor and adjust it to the required angle via ball joint (3).



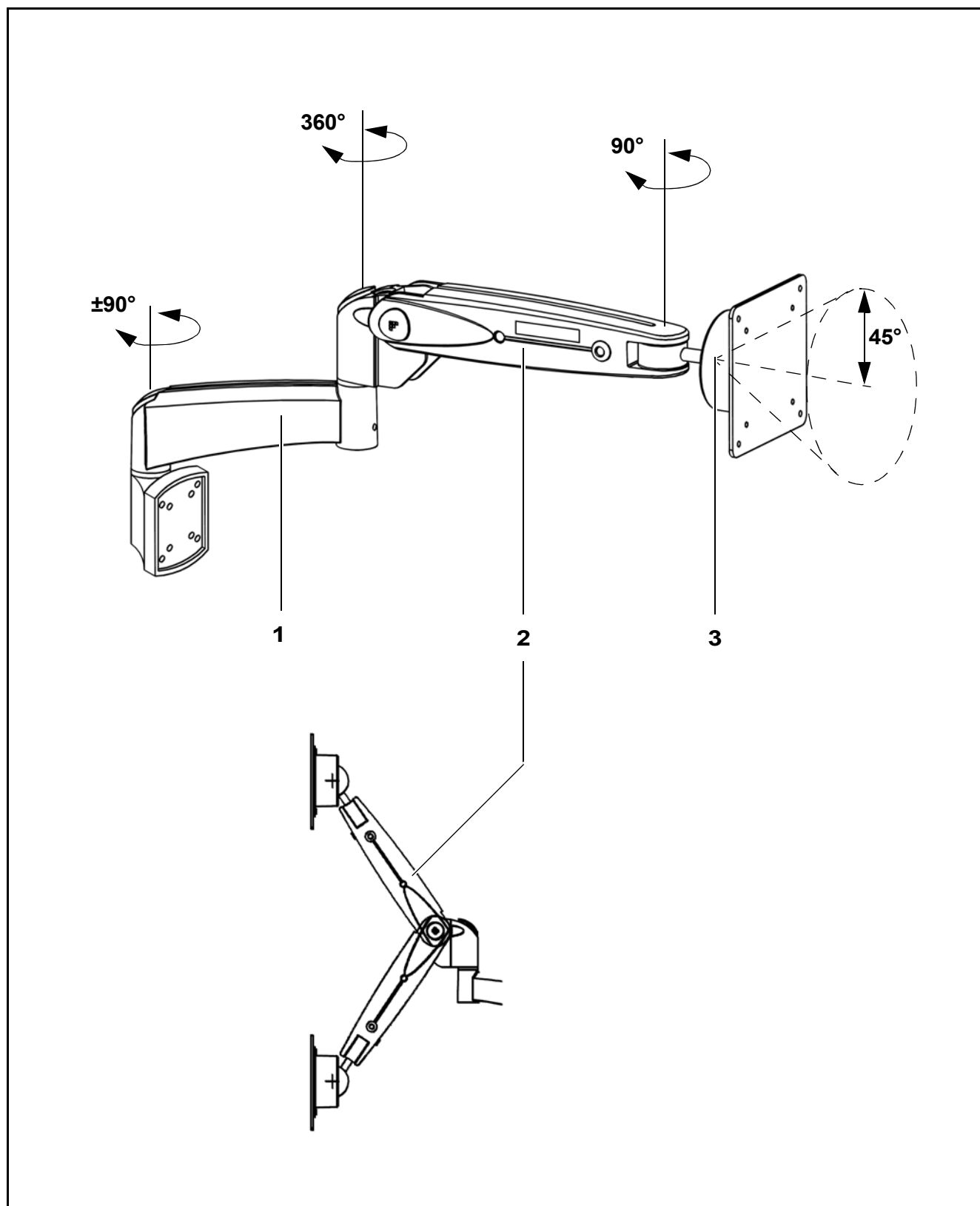
Warning!

Risk of injury due to lowering of the TFT monitor!

- Ageing processes may lead to the loss of gas in the gas pressure spring of the monitor's suspension arm, causing the TFT monitor to move downward of its own accord.
- Compensate for the loss of gas by readjusting the gas pressure spring as described on page 236.

If the TFT monitor continues to move downward, the gas pressure spring is defective.

- Notify our service representative.



S8 ceiling mount

Intended use

The S8 ceiling mount is a suspension system for Zeiss surgical microscopes. It is used to power and control the motorized functions of the surgical microscope. The hallmarks of the S8 ceiling mount are its superb mobility and easy operation. The motorized functions can be activated using a foot control panel.

Further useful functions include, for example:

- magnetic brakes for almost effortless positioning,
- fully automatic lamp change in the halogen light source,
- brightness control via a foot control panel,
- reset of X-Y coupling, focus and zoom,
- standby position,
- user-defined basic settings for a maximum of nine users:
 - speeds for focus, zoom and X-Y coupling
 - and configurable buttons on the foot control panel for focus memory, XY inversion, camera release, swinging SDI in/out, triggering an AUX signal.



Warning!

When using the Superlux Eye light source, only operate the system with special xenon lamps approved by Carl Zeiss for ophthalmic surgery. If any other than Carl Zeiss-approved xenon lamps are used, there is the risk of severe injury to the patient's eye.

Description of components

The S8 ceiling mount comprises an articulated arm, a suspension arm with the lamp housing and a control unit.

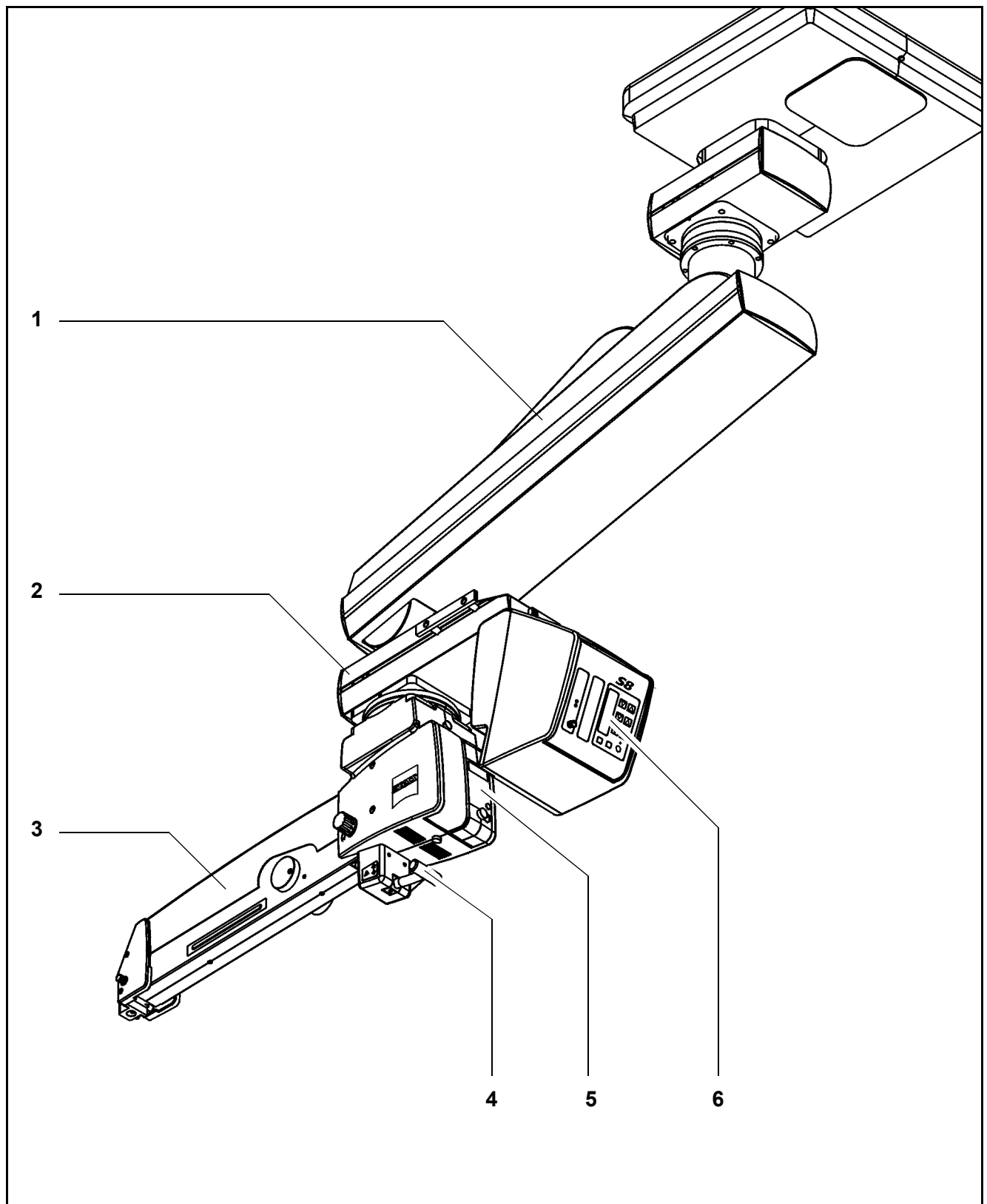
The articulated arm consists of a lift arm and a carrier arm. The lifting function permits the ceiling mount to be moved to a standby position. A grip is provided for height adjustment of the ceiling mount.

The suspension arm with the lamp housing and the control unit is mounted on the carrier arm. The control unit is rotatable through 180° (70° if the Superlux Eye light source with additional, integrated halogen light source is used) and contains all electrical supply systems required for the control of a motorized surgical microscope. The motorized functions can be activated using a foot control panel.

The suspension arm permits almost effortless positioning of the surgical microscope. The spring force of the suspension arm can be varied in a range from 8 to 20 kg, permitting reliable balancing of the microscope even with heavy accessory equipment. The downward movement of the suspension arm can be limited as required.

Design

- 1** Lift arm
- 2** Carrier arm
- 3** Suspension arm
- 4** Grip
for moving the ceiling mount into the standby or working position.
- 5** Light source, see page 78
- 6** Control unit



Power switch with connector (option)

The power switch and the connector can be either installed in the OR, or they can be integrated in the ceiling mount, at the back of the carrier arm (see illustration).

1 Rail

The delivery package contains a cable clip which is used to guide the cable of the foot control panel away from the operating table. The cable clip can be easily attached to rail (1) either on the left or right side of the arm.

2 Power switch

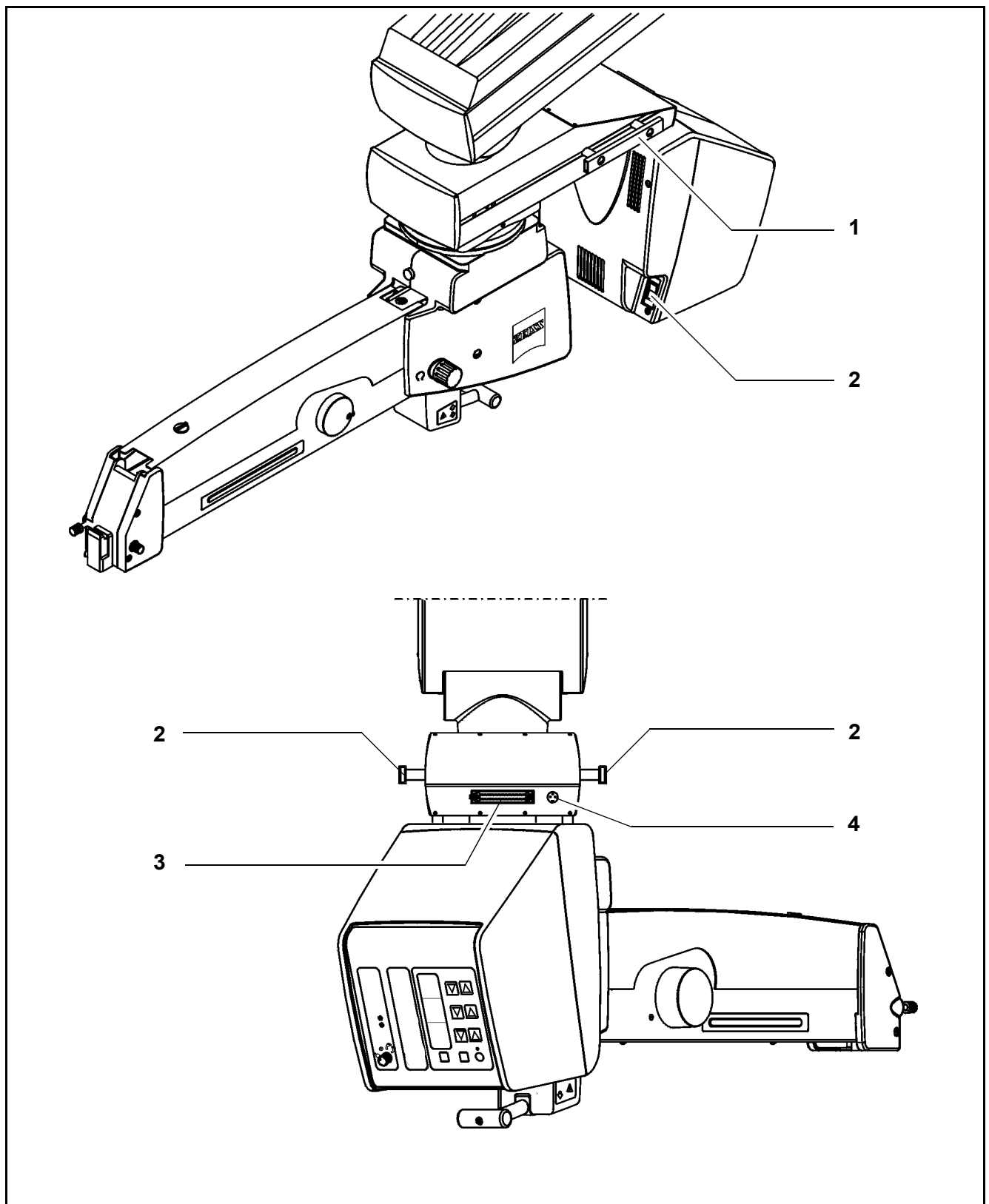
When the suspension system is on, the green indicator light in the switch is lit.

3 Connector for control component (option)

Permits optional connection of a foot control panel. (In the standard version, the connector is integrated in the wall console).

4 Remote socket

for triggering an AUX signal, e.g. to switch on/off an external device operating at max. 24V/0.5A.



S81 ceiling mount

Intended use

The S81 ceiling mount is a suspension system for Zeiss surgical microscopes. It is used to power and control the motorized functions of the surgical microscope. The hallmarks of the S81 ceiling mount are its superb mobility and easy operation. The motorized functions can be activated using a foot control panel.

Further useful functions include, for example:

- magnetic brakes for almost effortless positioning,
- fully automatic lamp change in the halogen light source,
- brightness control via a foot control panel,
- reset of X-Y coupling, focus and zoom,
- user-defined basic settings for a maximum of nine users:
 - speeds for focus, zoom and X-Y coupling
 - and configurable buttons on the foot control panel for focus memory, XY inversion, camera release, swinging SDI in/out, triggering an AUX signal.



Warning!

When using the Superlux Eye light source, only operate the system with special xenon lamps approved by Carl Zeiss for ophthalmic surgery. If any other than Carl Zeiss-approved xenon lamps are used, there is the risk of severe injury to the patient's eye.

Description of components

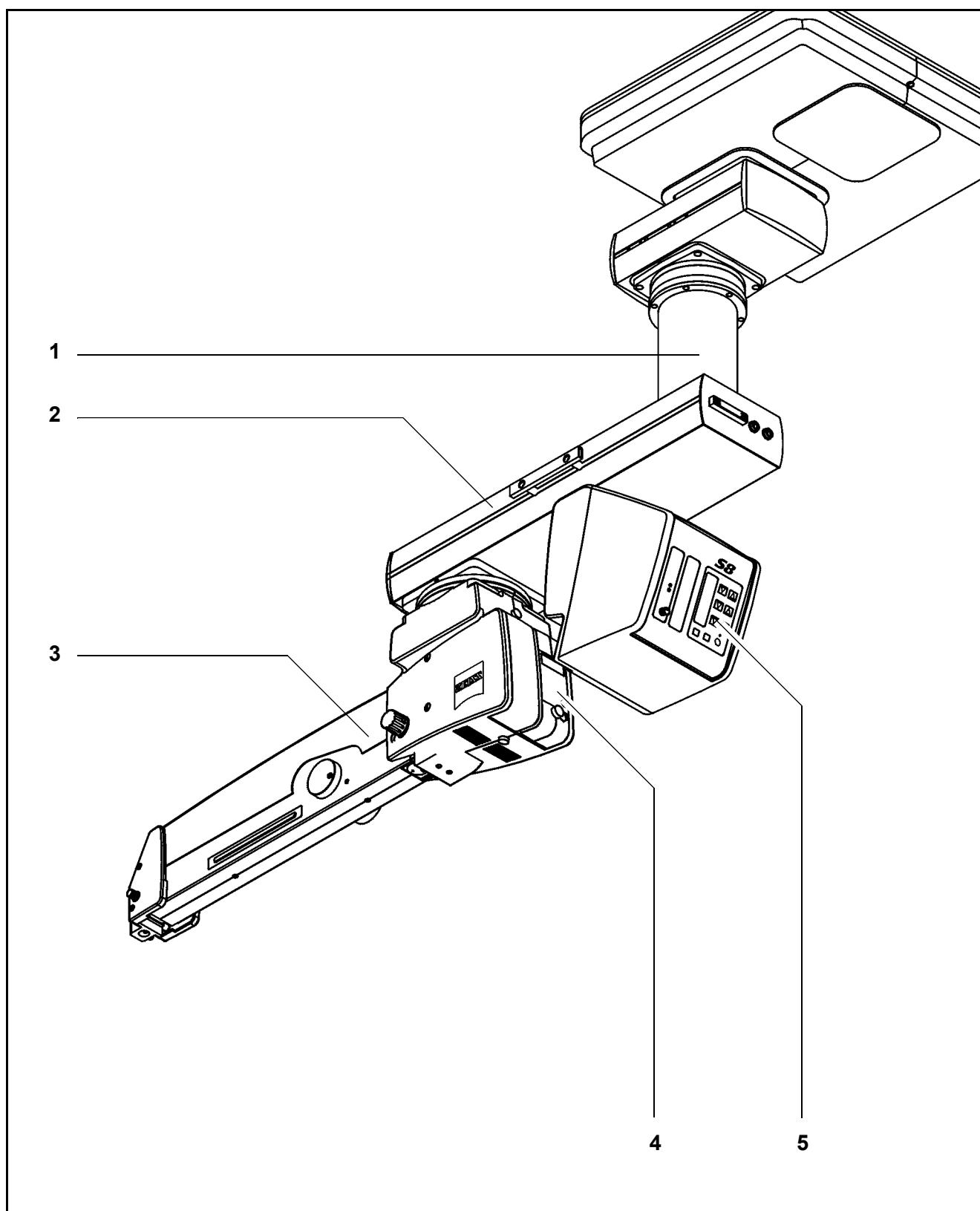
The S81 ceiling mount comprises a column, a carrier arm and a suspension arm.

The suspension arm with the lamp housing and the control unit is mounted on the carrier arm. The control unit is rotatable through 180° (70° if the Superlux Eye light source with additional, integrated halogen light source is used) and contains all electrical supply systems required for the control of a motorized surgical microscope. The motorized functions can be activated using a foot control panel.

The suspension arm permits almost effortless positioning of the surgical microscope. The spring force of the suspension arm can be varied in a range from 8 to 20 kg, permitting reliable balancing of the microscope even with heavy accessory equipment. The downward movement of the suspension arm can be limited as required.

Design

- 1 Column
- 2 Carrier arm
- 3 Suspension arm
- 4 Light source, see page 78
- 5 Control unit



Power switch, connector and socket (option)

The connector and socket can be either installed in the OR, or they can be integrated in the ceiling mount, at the back of the carrier arm (see illustration).

1 Rail

The delivery package contains a cable clip which is used to guide the cable of the foot control panel away from the operating table. The cable clip can be easily attached to rail (1) either on the left or right side of the arm.

2 Power switch

When the suspension system is on, the green indicator light in the switch is lit.

3 Connector for control component (option)

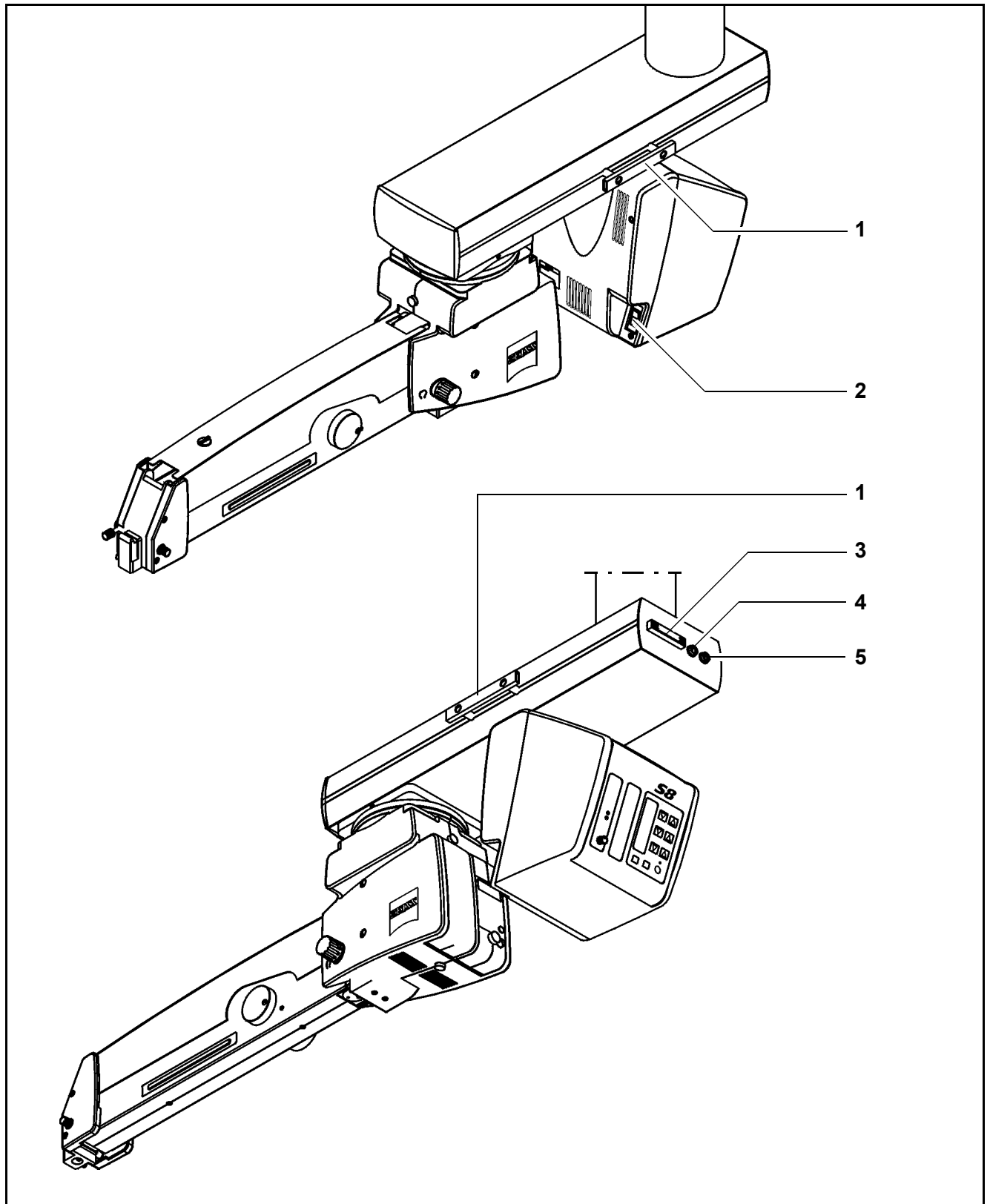
Here, a foot control panel can be connected.

4 Socket for control component (option)

If the ceiling mount is installed on a ceiling track mount, you can use a foot control panel to move the ceiling mount to its working position or standby position.

5 Remote socket

for triggering an AUX signal, e.g. to switch on/off an external device operating at max. 24V/0.5A.



OPMI Lumera T with integrated assistant's microscope on S88 floor stand

Intended use

OPMI Lumera T has been designed for the magnified visualization of the field of view during surgical procedures in ophthalmology. The system is intended for use in offices, hospitals or other human medicine institutions.

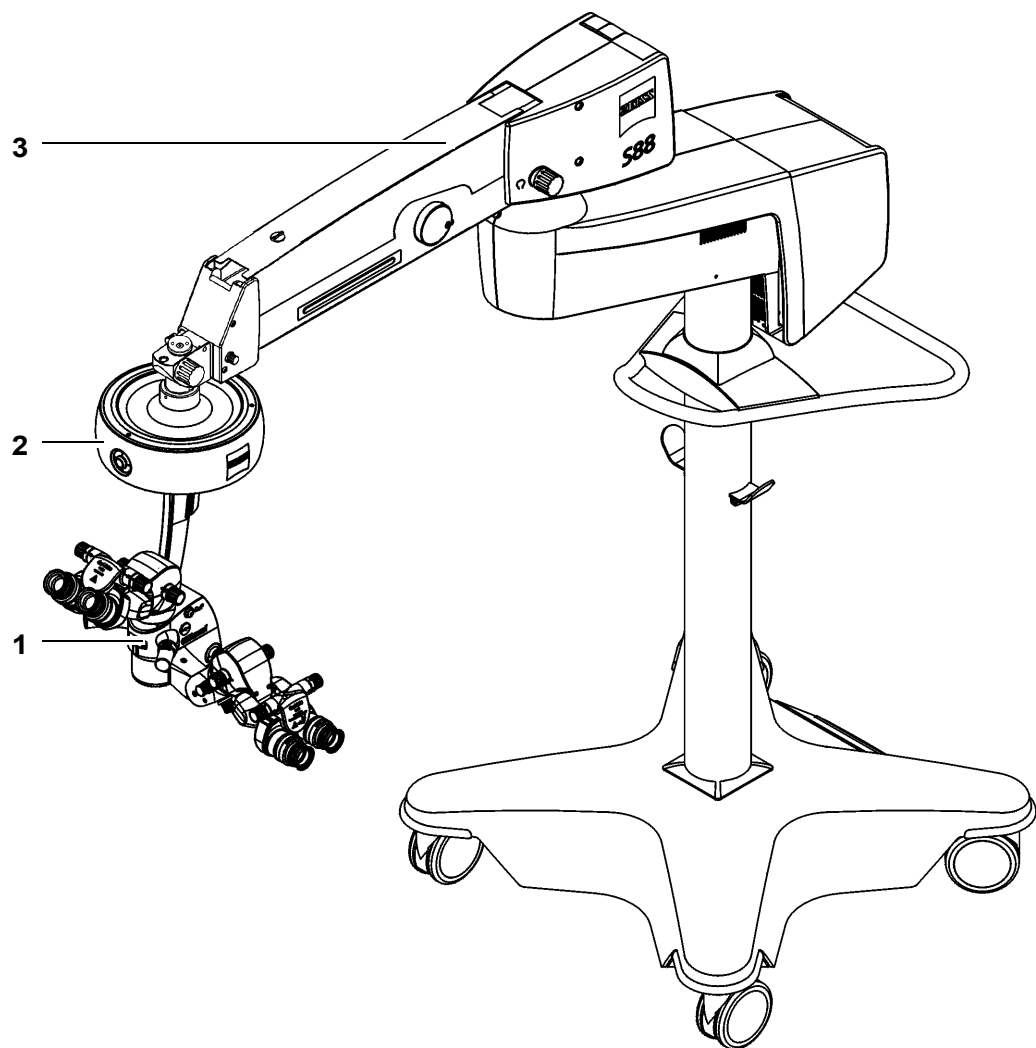
The system must only be operated by physicians, nurses and other medical staff who have undergone appropriate training and observe the instructions of the user's manual. The installation conditions and the use of the system must meet microsurgical requirements:

- low vibration
- clean environment
- avoidance of extreme mechanical stress.

Design

OPMI Lumera T comprises the surgical microscope with the integrated assistant's microscope, the X-Y coupling and the suspension system. The suspension system is used to power and control the motorized functions of the surgical microscope. The hallmarks of the S88 floor stand are its superb mobility and easy operation. Four steerable casters on the stand base permit easy positioning in the OR. The motorized functions of the surgical microscope can be activated using a foot control panel.

- 1** Surgical microscope with integrated assistant's microscope
- 2** X-Y coupling
- 3** S88 floor stand



OPMI Lumera T with integrated assistant's microscope on S8 ceiling mount

Intended use

OPMI Lumera T has been designed for the magnified visualization of the field of view during surgical procedures in ophthalmology. The system is intended for use in offices, hospitals or other human medicine institutions.

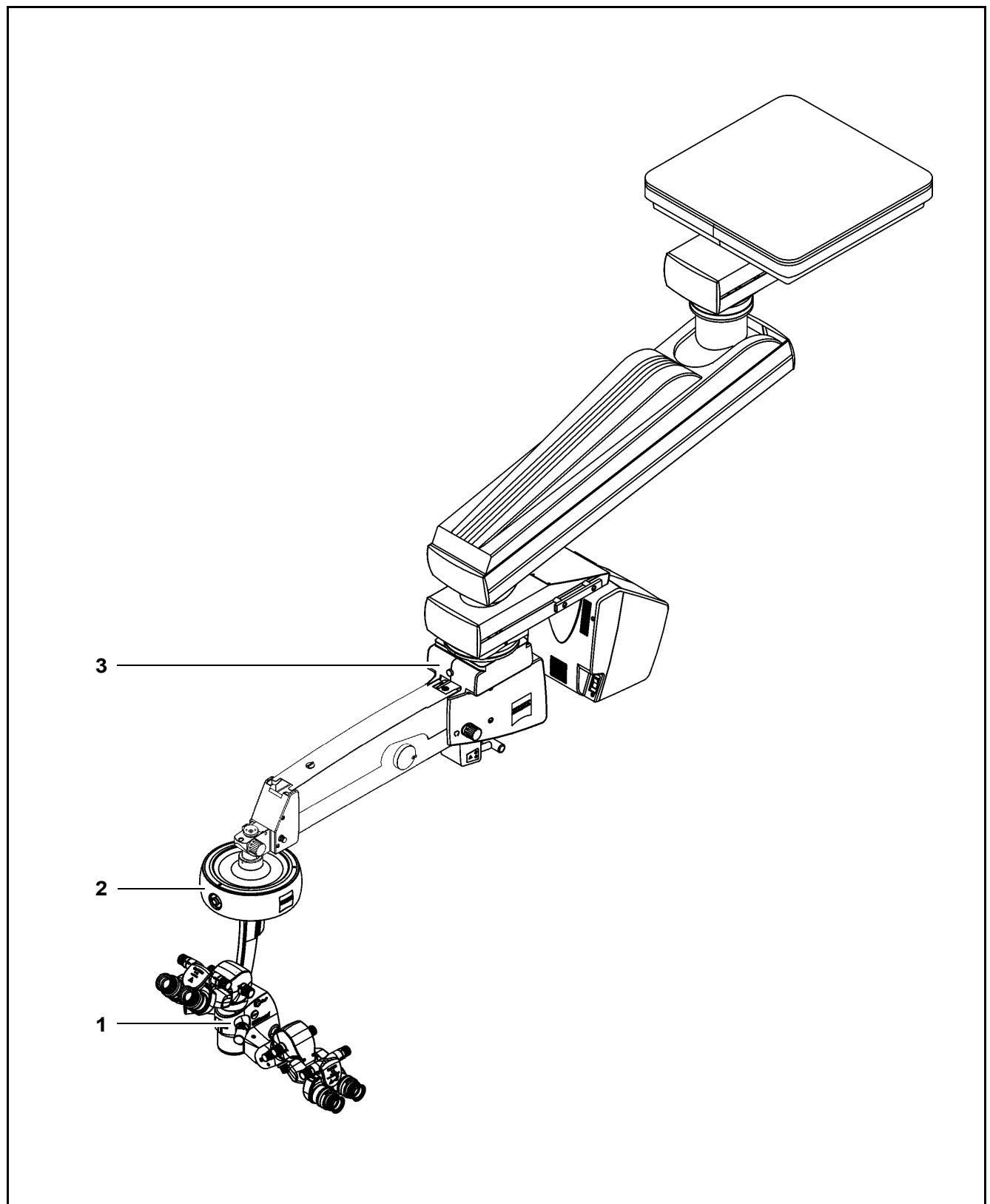
The system must only be operated by physicians, nurses and other medical staff who have undergone appropriate training and observe the instructions of the user's manual. The installation conditions and the use of the system must meet microsurgical requirements:

- low vibration
- clean environment
- avoidance of extreme mechanical stress.

Design

OPMI Lumera T comprises the surgical microscope with the integrated assistant's microscope, the X-Y coupling and the suspension system. The suspension system is used to power and control the motorized functions of the surgical microscope. The hallmarks of the S8 ceiling mount are its superb mobility and easy operation. The motorized functions of the surgical microscope can be activated using a foot control panel.

- 1 Surgical microscope with integrated assistant's microscope
- 2 X-Y coupling
- 3 S8 ceiling mount



OPMI Lumera T with integrated assistant's microscope on S81 ceiling mount

Intended use

OPMI Lumera T has been designed for the magnified visualization of the field of view during surgical procedures in ophthalmology. The system is intended for use in offices, hospitals or other human medicine institutions.

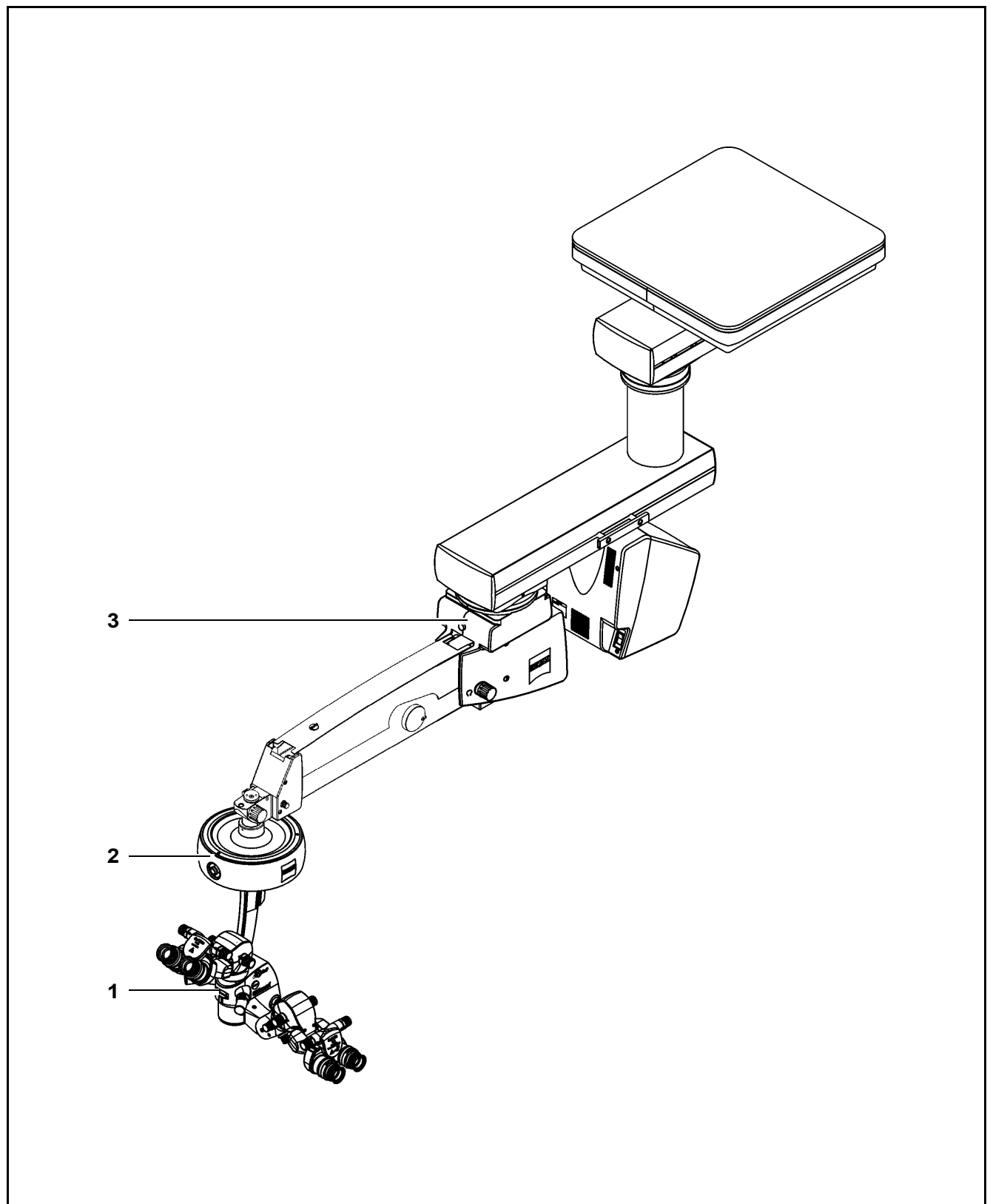
The system must only be operated by physicians, nurses and other medical staff who have undergone appropriate training and observe the instructions of the user's manual. The installation conditions and the use of the system must meet microsurgical requirements:

- low vibration
- clean environment
- avoidance of extreme mechanical stress.

Design

The S81 ceiling mount powers and controls the motorized functions of the surgical microscope. The hallmarks of the S81 ceiling mount are its superb mobility and easy operation. The motorized functions of the surgical microscope can be activated using a foot control panel.

- 1** Surgical microscope with integrated assistant's microscope
- 2** X-Y coupling
- 3** S81 ceiling mount



Foot control panel

Intended use

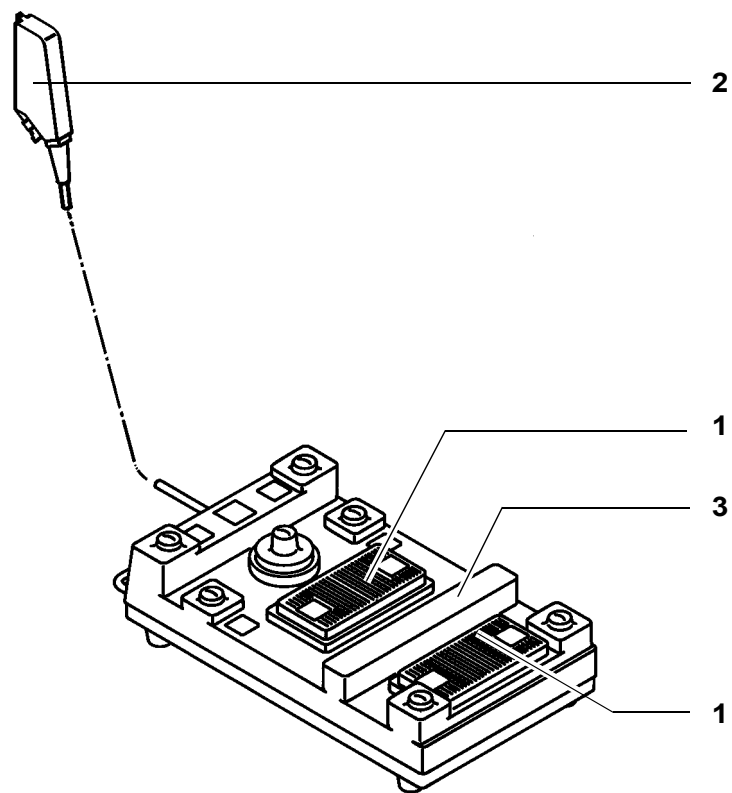
The foot control panel permits you to control 14 different functions of a suspension system or surgical microscope, provided these functions are part of your configuration (suspension system, surgical microscope). The assignment of the functions to the controls of the foot control panel is shown on the next page.

Design

The foot control panel is equipped with two rocker switches (1) for controlling the "zoom" and "focus" functions. The up/down movements of these functions are located on the same side, allowing you to control the two directions by toe/heel movement, without having to shift your foot. Bridge (3) between two rocker switches (1) serves as a support to rest your foot on.

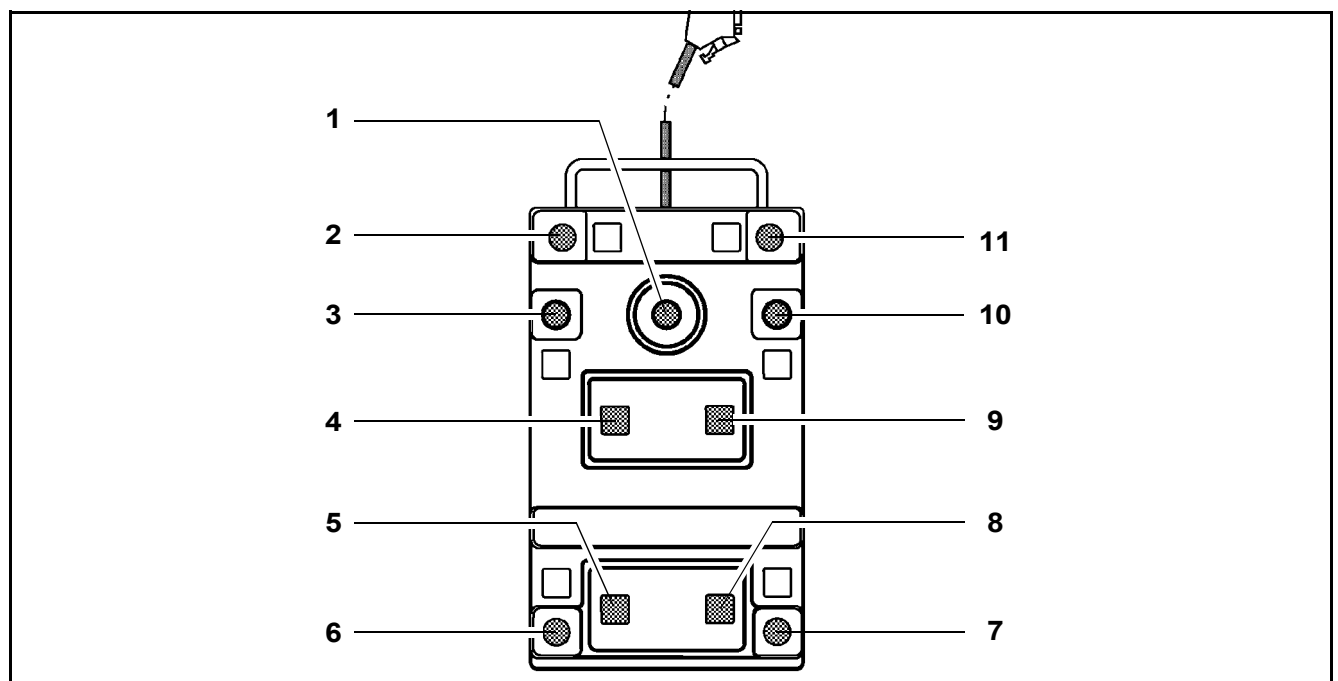
Connector (2) is used to connect the foot control panel to the connector of a suspension system or wall-mounted control panel.

The foot control panel is enclosed in a water-tight rubber case.



The illustration shows the standard assignment of functions to the foot control panel. On request, our service staff can change the assignment of the focus/zoom functions and that of buttons 3 and 10 (also labeled C and D in the menu).

- 1** Joystick for X-Y coupling
- 2** Reducing the lamp brightness
- 3** Recentering of the X-Y coupling and focus starting position (optional: control of Stereo Digital Inverter IIe / 3e from Oculus and of Visulux fiber slit lamp). The button is freely configurable, see page 196.
- 4** ZOOM ▼ Reducing magnification (optional: FOCUS ▲ Reducing working distance)
- 5** ZOOM ▲ Increasing magnification
- 6** On/Off of light source 1
- 7** On/Off of light source 2 (option)
- 8** FOCUS ▲ Reducing working distance, (ZOOM ▼ Reducing magnification)
- 9** FOCUS ▼ Increasing working distance
- 10** Controlling external devices using the Remote function (option: release of 35 mm camera) The button is freely configurable, see page 196.
- 11** Increasing the lamp brightness





Preparations

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Attaching the equipment

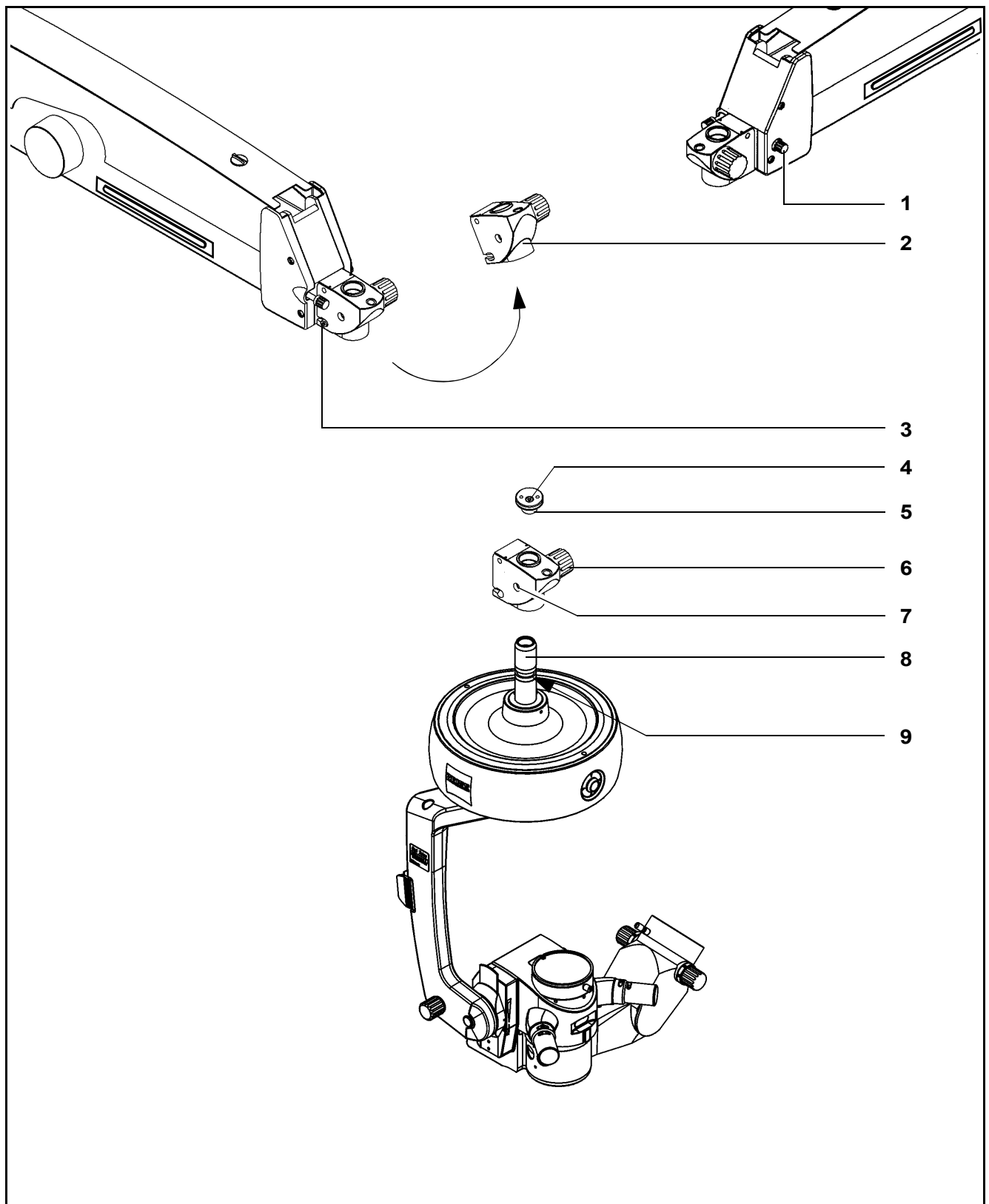
Mounting the surgical microscope



Warning!

The maximum weight of the microscope including accessories must not exceed 20 kg!

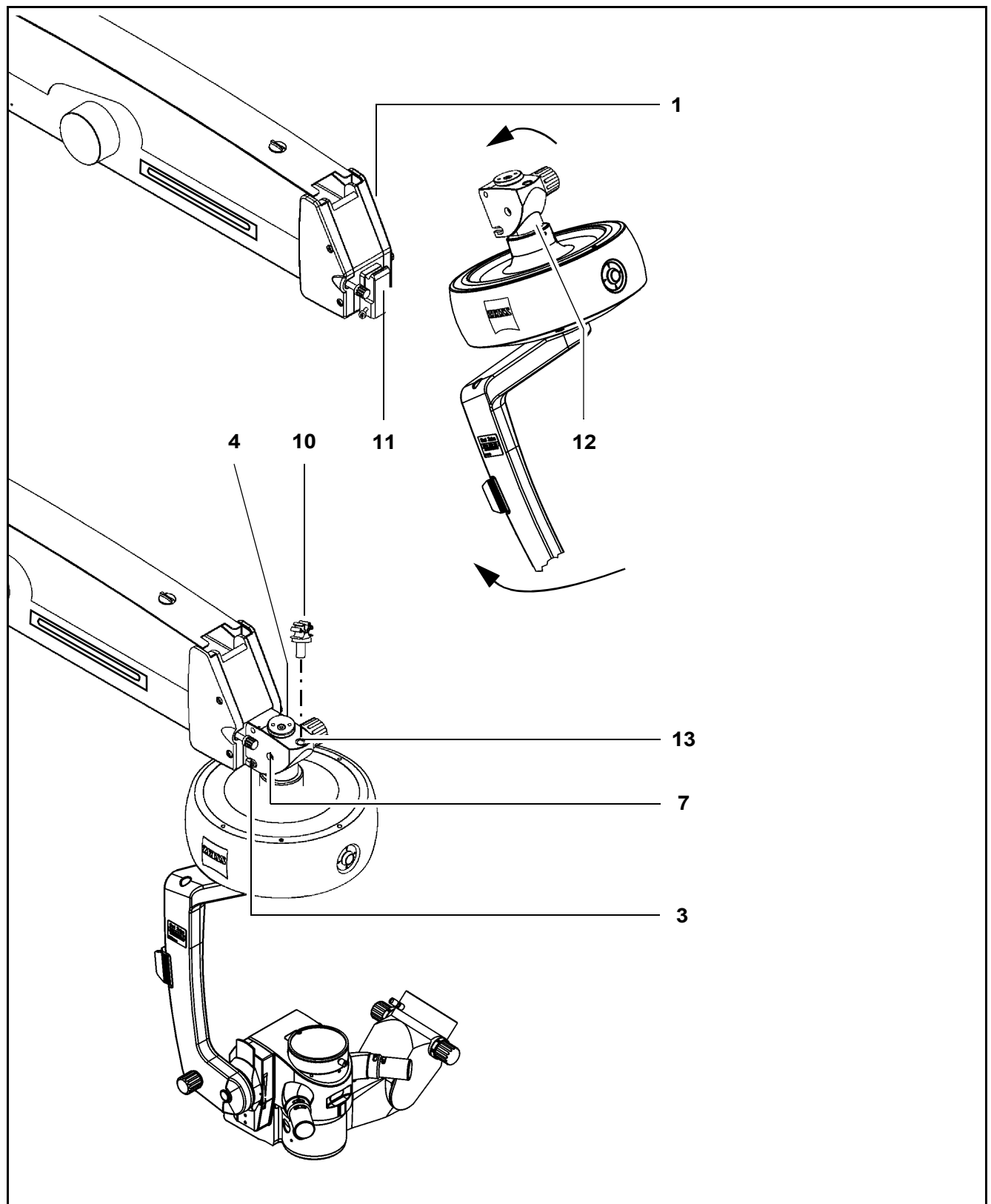
- Leave the suspension arm locked in its horizontal position until you
 - have mounted and secured the complete equipment,
 - and made the electrical connections.
- Then perform the balance setting procedure.
- Turn off the system at the power switch.
- Bring the suspension arm into its horizontal position, pull out locking knob (1) and turn it clockwise or counterclockwise through 180°. At the same time, slightly move the suspension arm up and down until the lock snaps in. This prevents the suspension arm from uncontrollably moving upward when insufficient weight is attached.
- Use a 4 mm hex key to loosen securing screw (3) by a few turns.
- Tilt coupling (2) upward and remove it in the upward direction.
- Loosen locking screw (6) by a few turns.
- Give securing screw (7) a few turns to loosen it.
- Slightly lubricate microscope shaft (8) (e.g. with instrument grease or vaseline).
- Slide coupling (2) from above over microscope shaft (8). Screw in securing screw (5) from above and firmly tighten securing screw (4) using a 4 mm hex key.
- Screw in securing screw (7) and tighten it firmly. Securing screw (7) must go into groove (9). This is ensured when the securing screw is flush with the outer surface.



- Hook coupling (12) with the attached surgical microscope from above into receptacle (11) on the suspension arm, and tilt the coupling downward into its vertical position.
- Firmly tighten securing screw (3) using a 5 mm hex key.
- Insert cable clip (10) into opening (13) of the coupling.
- Release the horizontal lock by loosening locking knob (1).
- Then perform the balance setting procedure.

**Warning!**

Before every use and after re-equipping the system, make sure that securing screws (3), (4) and (7) are firmly tightened!



Mounting the tube, the eyepieces and the objective lens



Note:

The main microscope comes with Invertertube (3), the integrated assistant's microscope with assistant's Invertertube (13). Alternatively, the binocular coobservation tube (10) and the 45° inclined tube (11) can be attached.

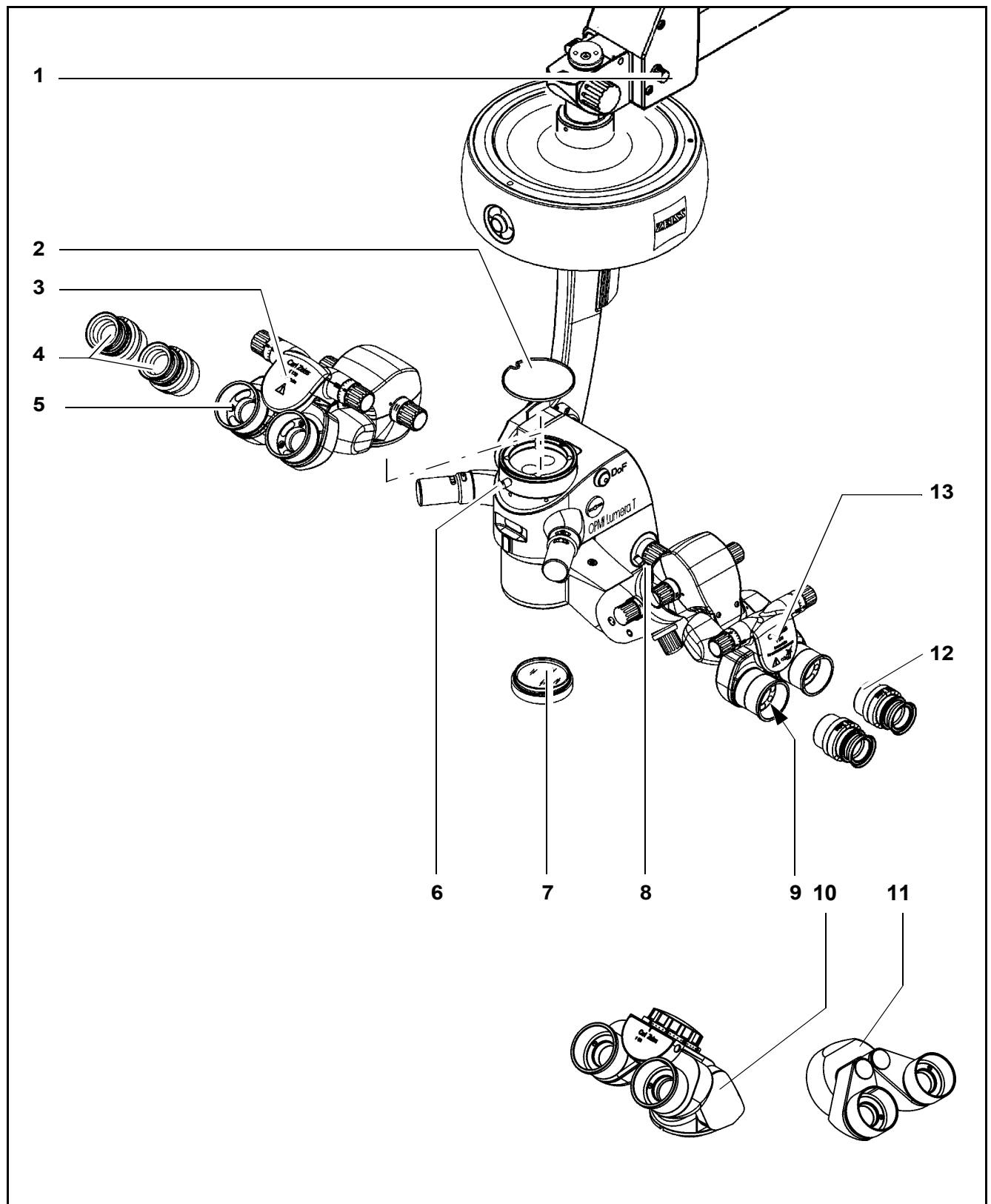
- Bring the suspension arm in a position convenient for you and firmly tighten locking knob (1).
- Give securing screw (6) a few turns to loosen it.
- Remove dust cover (2) and store it in a safe place.
- Place Invertertube (3) or binocular tube (10) on the microscope and firmly tighten securing screw (6).
- You can install further accessories between Invertertube (3) or binocular tube (10) and the microscope body. Lock these modules in position in the same way using securing screw (8).
- Place assistant's Invertertube (13) or 45° inclined tube (11) on the integrated assistant's microscope and firmly tighten securing screw (8).
- You can install further accessories between assistant's Invertertube (13) or 45° inclined tube (11) and the microscope body. Lock these modules in position in the same way using securing screw (8).
- Insert **10x** widefield eyepieces (5) as far as they will go in mounts (4) intended for them. The magnetic coupling reliably secures them in position.
- Insert **10x** widefield eyepieces (12) as far as they will go in mounts (9) intended for them. The magnetic coupling reliably secures them in position.



Note:

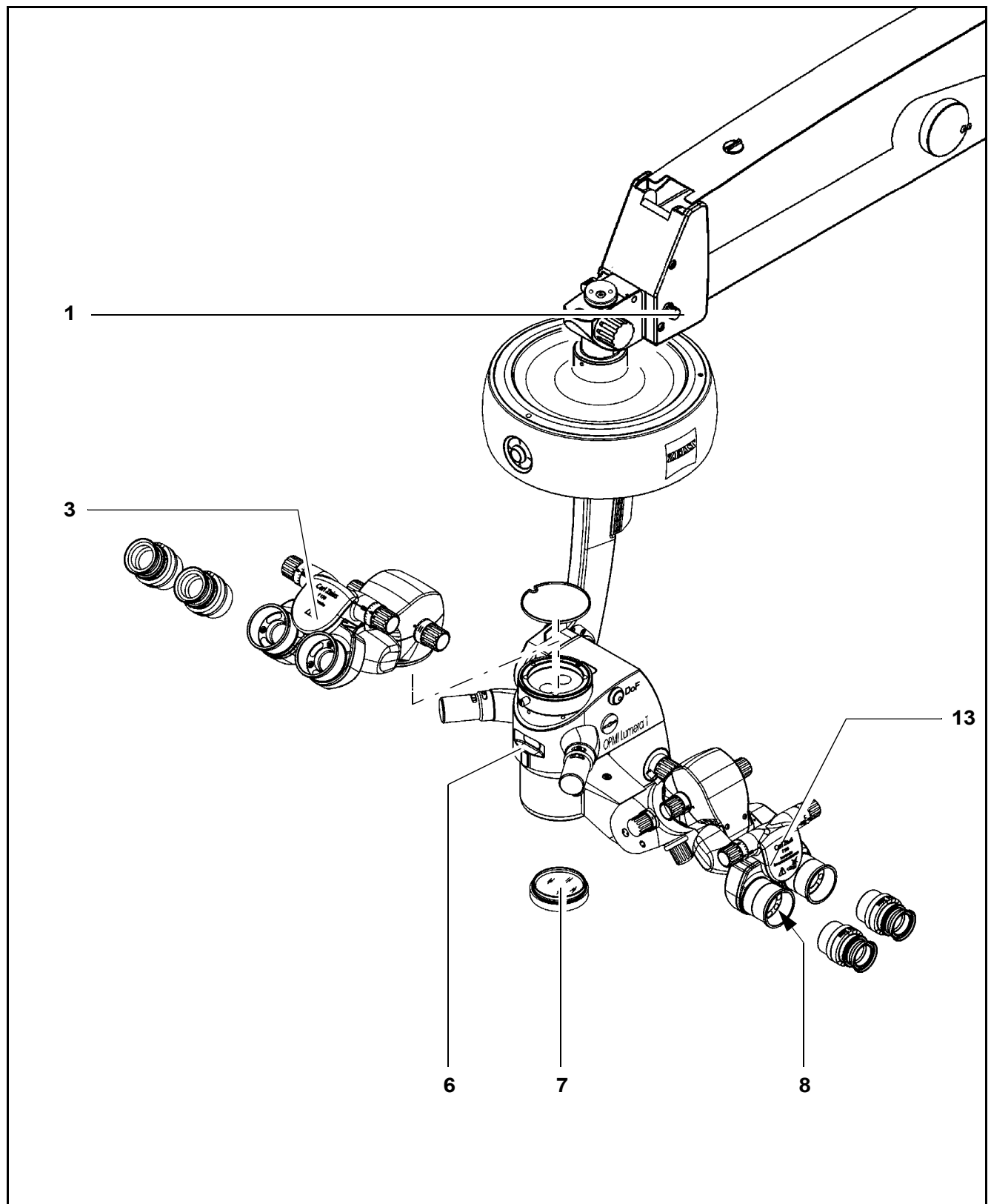
If you wish to use documentation equipment, we can supply an eyepiece with a reticle to aid focusing. The retrofitting of a reticle to an eyepiece can only be performed in the factory or by our service staff. Always install the eyepiece with the reticle on the same side of the binocular tube where the documentation equipment is located.

Screw objective lens (7) into the microscope body and tighten it firmly.



**Warning!**

- Before every use and after re-equipping the system, make sure that the two mounted tubes (3 and 13) are securely locked in position.
- Make sure that the following components are firmly tightened:
 - securing screws (6 and 8) and
 - objective lens (7)
- When attaching any components, take care not to damage the Deep-View system.
- Loosen locking knob (1).
- Re-adjust the balance of the suspension arm after every change of equipment.



Changing the microscope accessories

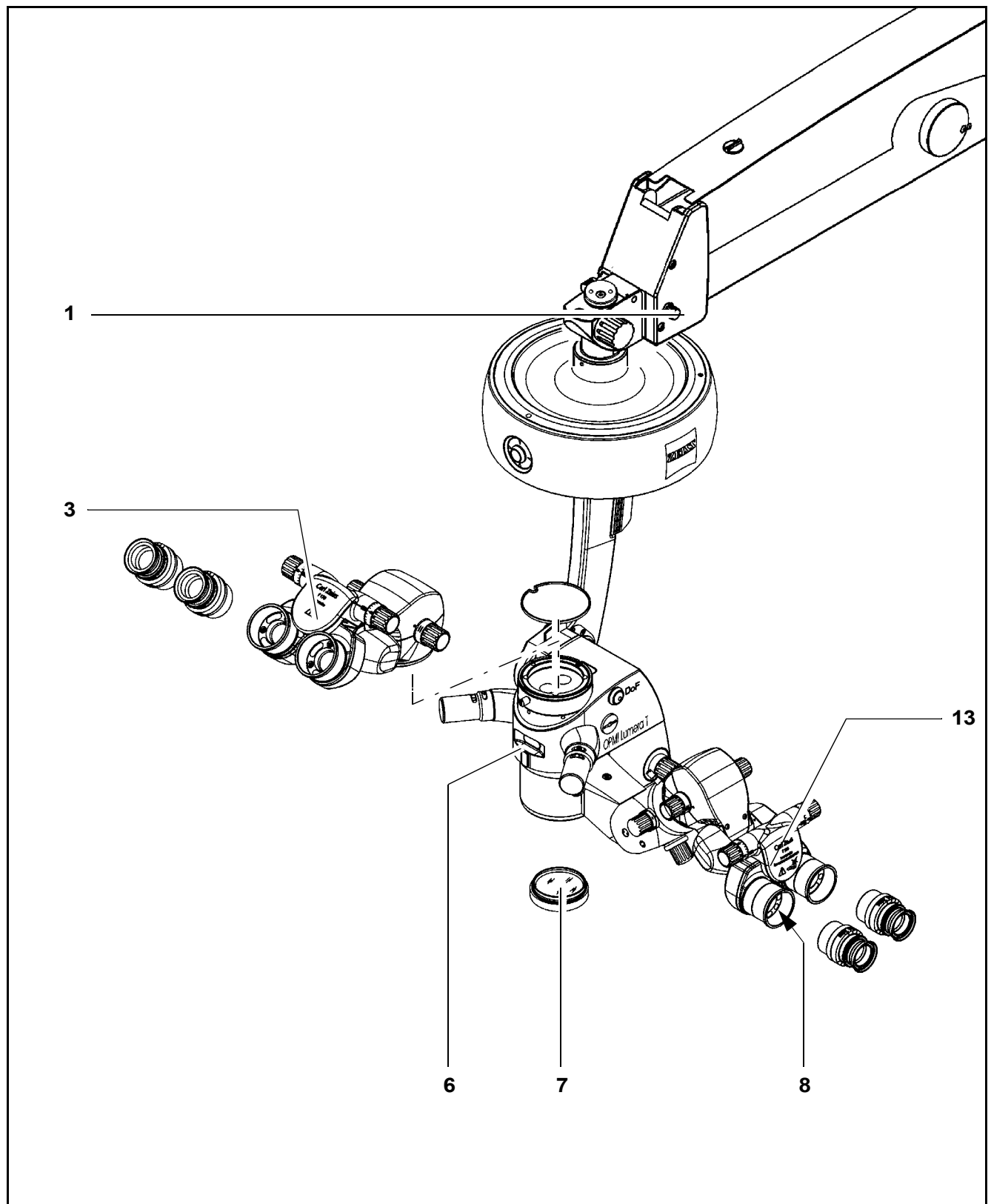
You can change the microscope accessories in reverse order to that described before. Please observe the following:

- Turn off the unit at the power switch before changing any accessories.
- Bring the suspension arm in a position convenient for you and firmly tighten locking knob (1).
- After changing the accessories, re-adjust the friction as required.



Warning!

- Before every use and after re-equipping the system, make sure that the two binocular tubes (3 and 13) are securely locked in position.
- Make sure that the following components are firmly tightened:
 - securing screws (6 and 8) and
 - objective lens (7)
- When attaching any components, take care not to damage the Deep-View system.
- Re-adjust the balance of the suspension arm after every change of equipment.



Connections

Connecting the surgical microscope

- Turn locking cap (1) by a quarter turn to the right or left and pull up cover (2).
- Plug microscope connector (3) into connector (4) and tighten the securing screws on the microscope connector.
- Press the microscope cable into cable clip (5). Install the cable in such a way that it is neither stretched nor kinked when the microscope is turned or tilted.
- Press down cover (2) as far as it will go and lock it with cap (1).

Connecting the light guide



Warning!

Risk of phototoxic injury to the patient's eye.

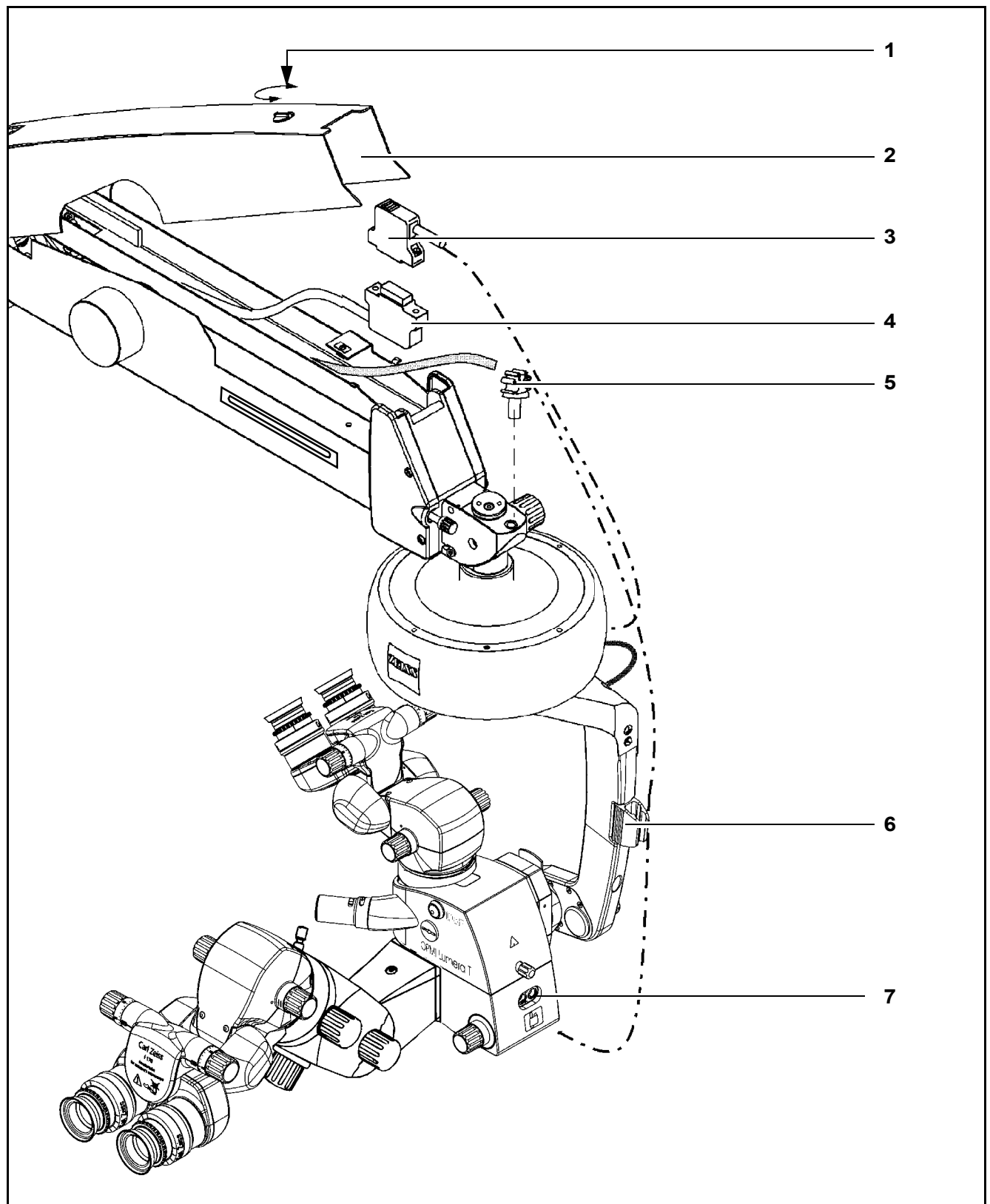
Only operate the VISULUXTM fiber slit lamp with the Superlux Eye light source if the light guide sleeve contains a UV filter. You can recognize an integrated UV filter by the silver-colored light guide connector of the VISULUXTM fiber slit lamp.

- Insert the end of the light guide into light guide connector (7) of the microscope as far as it will go, and press the light guide into cable clip (6). For correct mounting, please see the label provided under light guide connector (7).



Note:

Make sure that the light guide is not stretched or bent when the microscope is turned or tilted.

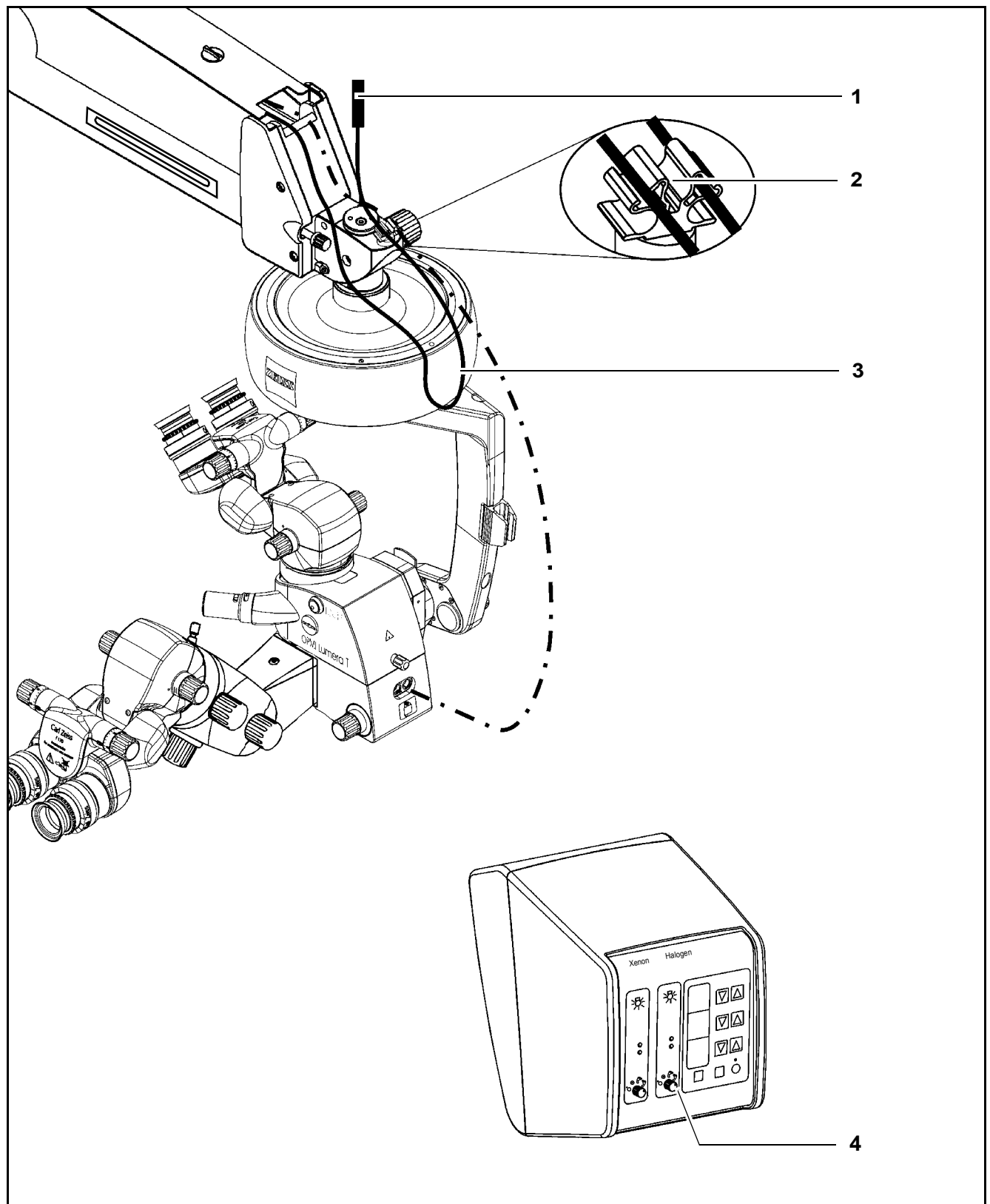


**Warning!**

It may happen that no second lamp module such as the VISULUX™ fiber slit lamp is used on the microscope.

To prevent light guide (3) provided for this purpose from injuring the patient, you must attach it to the cable holder of the suspension system.

- Switch off the illumination system for the unneeded light guide by setting the illumination selector switch (4) to the left.
- Press the light guide into an empty position of cable holder (2).
- Remove cap (1) from the light guide. This prevents melting of the cap in case the second illuminator is switched on by mistake.



Strain relief device on S88 floor stand

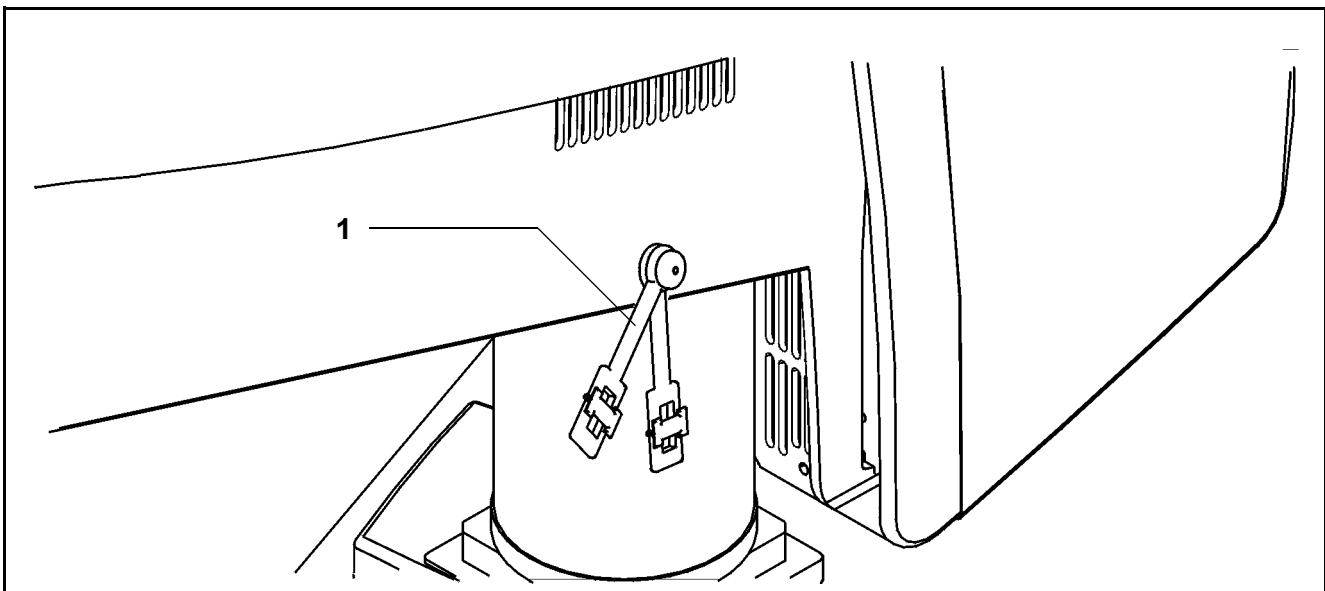


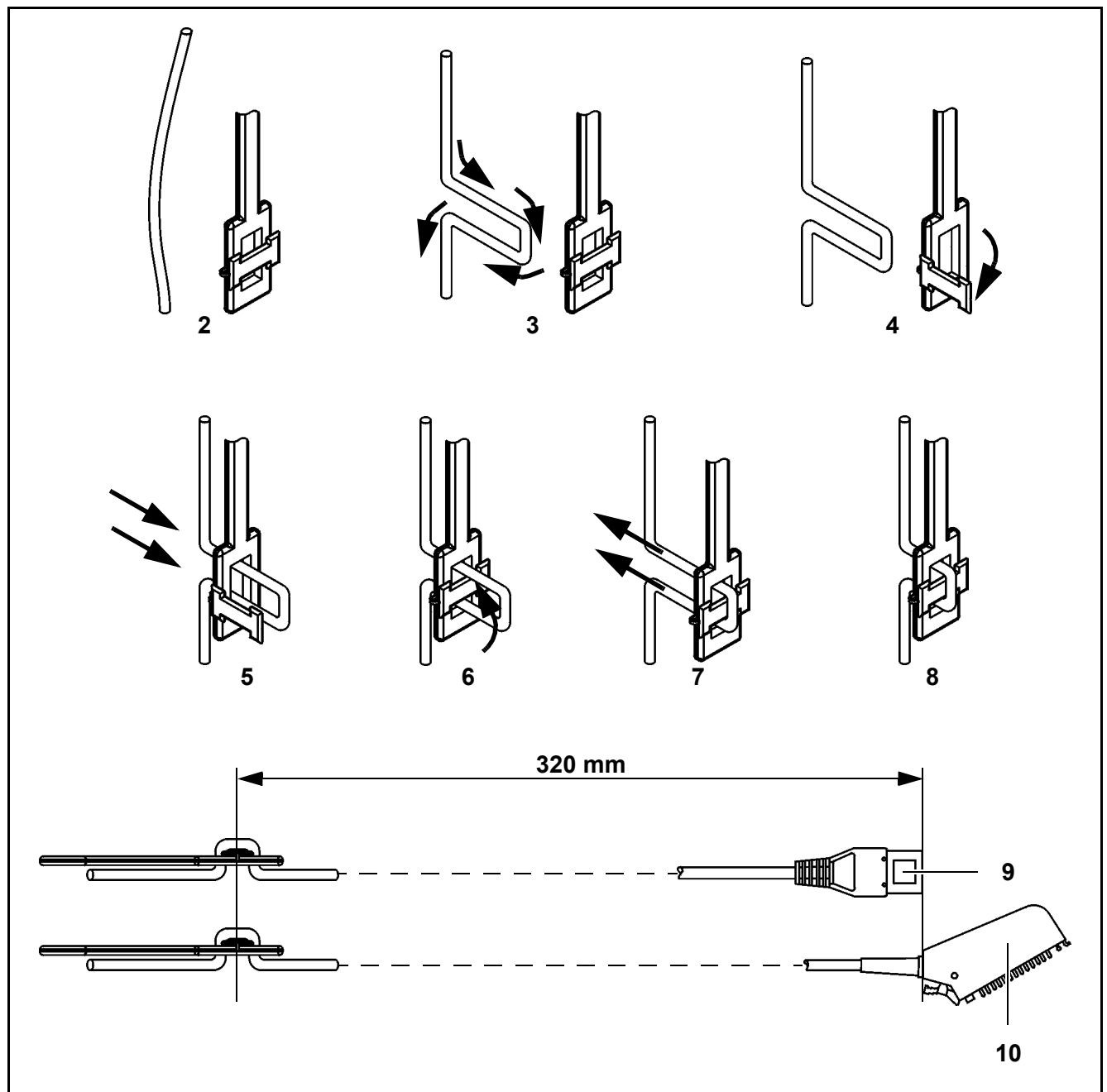
Note:

You can secure the power plug and the multipoint connector of the switching component against inadvertent loosening by installing the two cables in strain relief device (1).

After you have mounted strain relief device (1), the cable must have the following length:

- 320 mm from the strain relief device up to and including power connector (9).
- 320 mm from the strain relief device up to connector (10) of the foot control panel or of an operating chair with appropriate footswitch.
- Form a loop with the cable as shown in (3).
- Open flap (4).
- Feed the cable through opening (5).
- Close flap (6).
- Tighten the cable until it encloses flap (7).
- Check the length of the cable.





Connecting the S88 floor stand

- Check the voltage indicated at (3).

**Caution:**

The suspension system is set at the factory to the rated voltage used in the country of destination. The rated voltage indicated at window (3) must correspond to the rated voltage available on the site of installation. If this is not the case, you must re-adjust the sliding switch using a suitable tool.

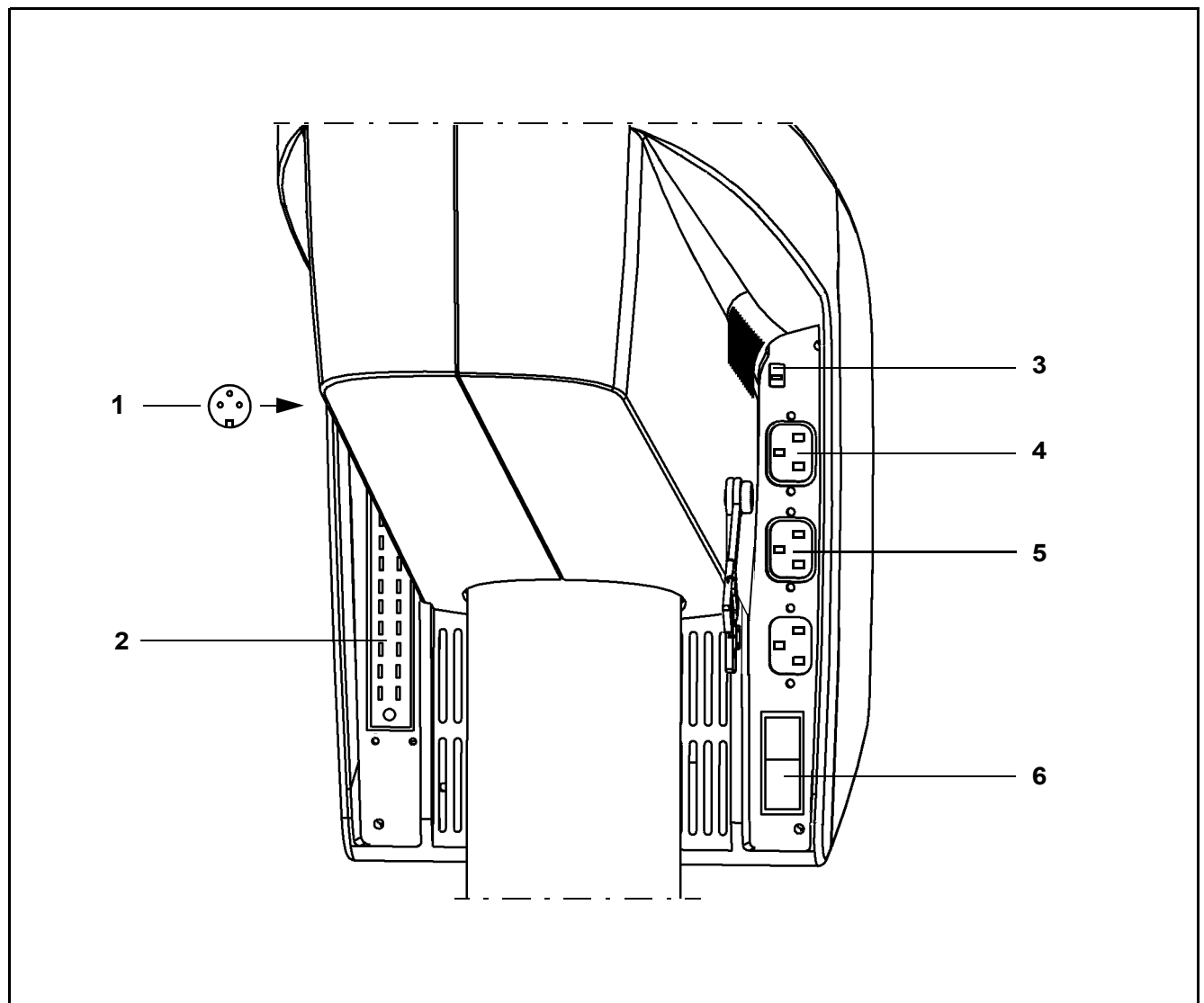
**Note:**

Insert or remove connectors at (2), (4) and (5) only if power switch (6) is off.

- Plug the connector of the foot control panel or operating chair into connector (2) of the suspension system.
- Secure the microscope cable in the cable clip in such a way that it is not stretched or bent when the microscope is turned or tilted.
- Secure the light guide in the cable clip and insert the light guide into the light guide socket on the microscope as far as it will go. Make sure that the light guide is not stretched or bent when the microscope is turned or tilted.

Use remote control socket (1) to connect external devices with max. 24 V / 0.5 A which can be switched on / off via an AUX signal using the freely programmable buttons on the foot control panel.

Connect the suspension system to line power using the power cord intended for it. Only use a power outlet which is provided with a properly connected protective earth conductor.



Relocating the system



Note:

As the stand is very easy to maneuver, there is a tendency to underestimate its considerable weight. Therefore, move the stand slowly and carefully!

Please observe the following points when relocating the stand:

- Fold the suspension arm to its moving position (see illustration on the opposite page).
- Switch off the illumination system using the knobs, and the system at its power switch.
- Unplug the power cord from the wall outlet.
- Wind up the cable of the foot control panel on one of the cable supports, and hang the foot control panel on the handle.
- Wind up the power cord on the other cable support.
- Use the maneuvering handle for moving the stand.
- Be careful of heights when passing through doorways.
- Avoid collisions of any kind.
- Do not go over steps and edges: The stand might topple!
- Be extremely careful when moving over slopes.
- Do not park the stand on slopes.

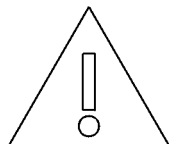


Press the brake tab to lock the stand in position. Make sure that the stand is no longer able to roll away by itself.

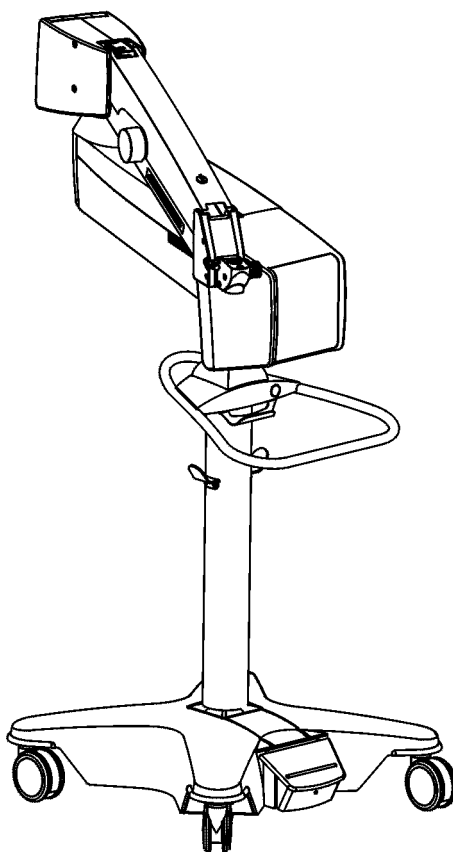


Caution:

Over longer distances (e.g. removal, return for repair, etc), the instrument must always be transported in the original packaging or in special return packaging. For details, please contact your dealer or the Carl Zeiss service team.



Transportposition
Moving position
Position de transport
Posicion de transporte



Adjusting the suspension system

Adjusting the balance setting of the suspension arm

- Only perform the balance setting procedure with the complete microscope equipment attached!



Note:

We recommend that you perform coarse balancing of the suspension arm before starting with precise balance setting of the suspension arm. The suspension arm must be locked in the horizontal position for this procedure.

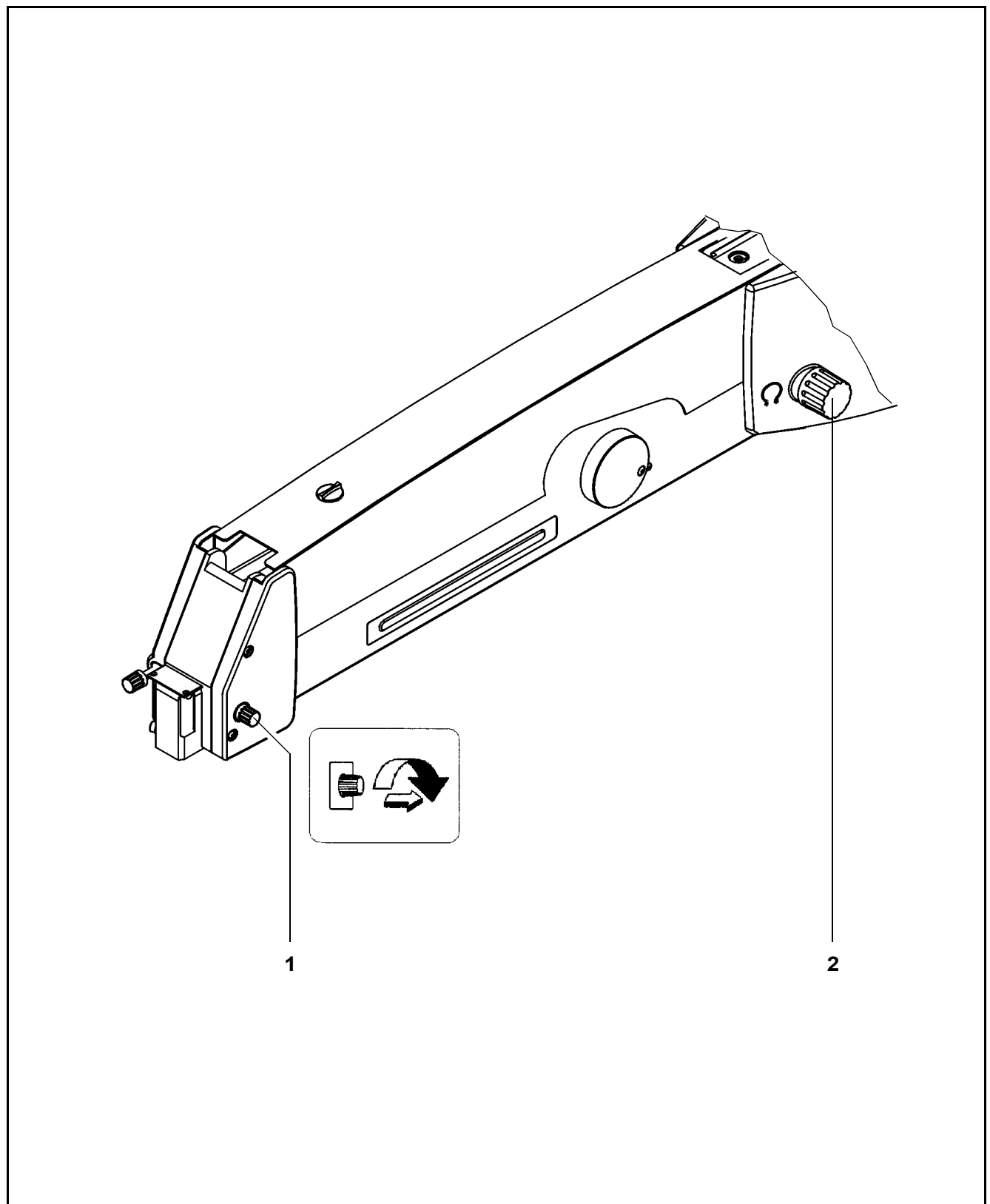
- For coarse balancing, move the suspension arm slightly up and down. At the same time, turn adjustment screw (2) until you think that the spring force is sufficient to compensate for the weight of the surgical microscope and accessories.



Note:

Turning the screw clockwise increases the spring force, turning it counterclockwise reduces the spring force.

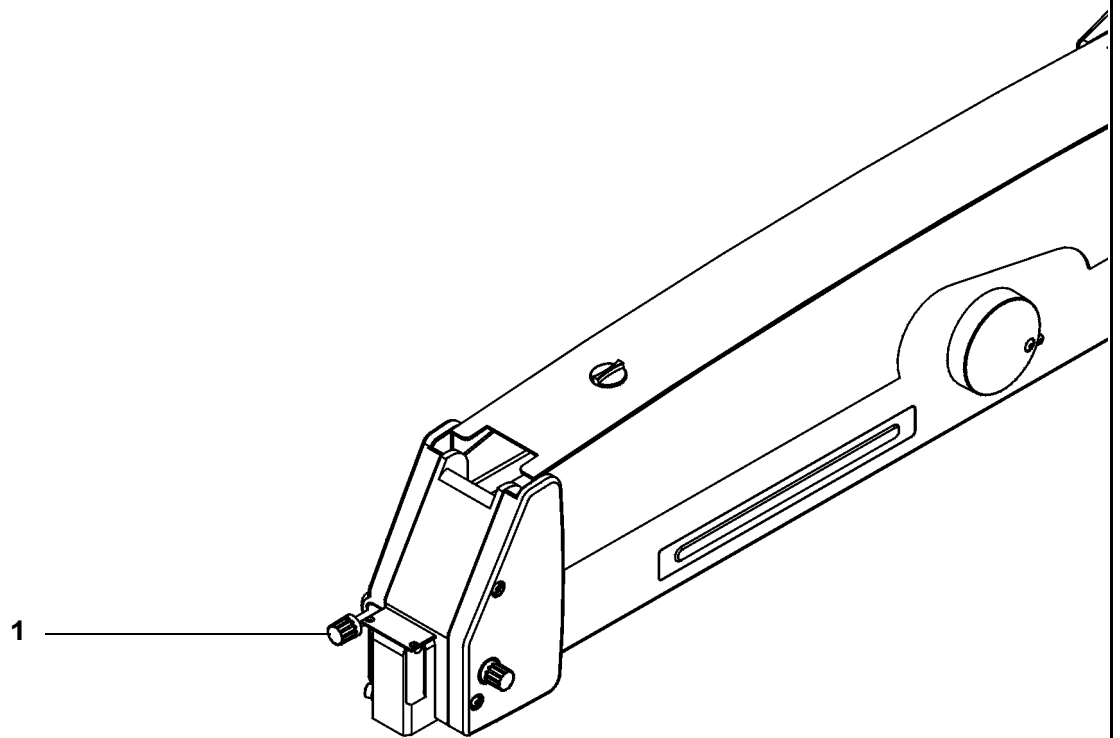
- Hold the suspension arm and pull out locking knob (1). This must be possible without major effort. Otherwise, readjust the spring force using adjustment screw (2).
- During the balancing procedure, press one of the magnetic brake release buttons on the surgical microscope. Move the suspension arm up and down alternately by approx. 20 cm. Use adjustment screw (2) to adjust the spring force in such a way that the effort required to move the arm up or down is the same.



Adjusting the limit of downward movement

The downward travel of the suspension arm must be limited in such a way that no hazard is caused to the patient's safety even if the surgical microscope is inadvertently lowered.

- Give adjustment screw (1) a few turns to loosen it.
- Press one of the magnetic brake release buttons on the surgical microscope and lower the surgical microscope until it can be focused on the surgical field (depending on the focal length of the objective lens), while at the same time allowing for a sufficient safety distance from the surgical field.
- Turn adjustment screw (1) clockwise as far as it will go.
- Lower the surgical microscope again to its bottom stop and check the safety distance.



Positioning the S8 ceiling mount

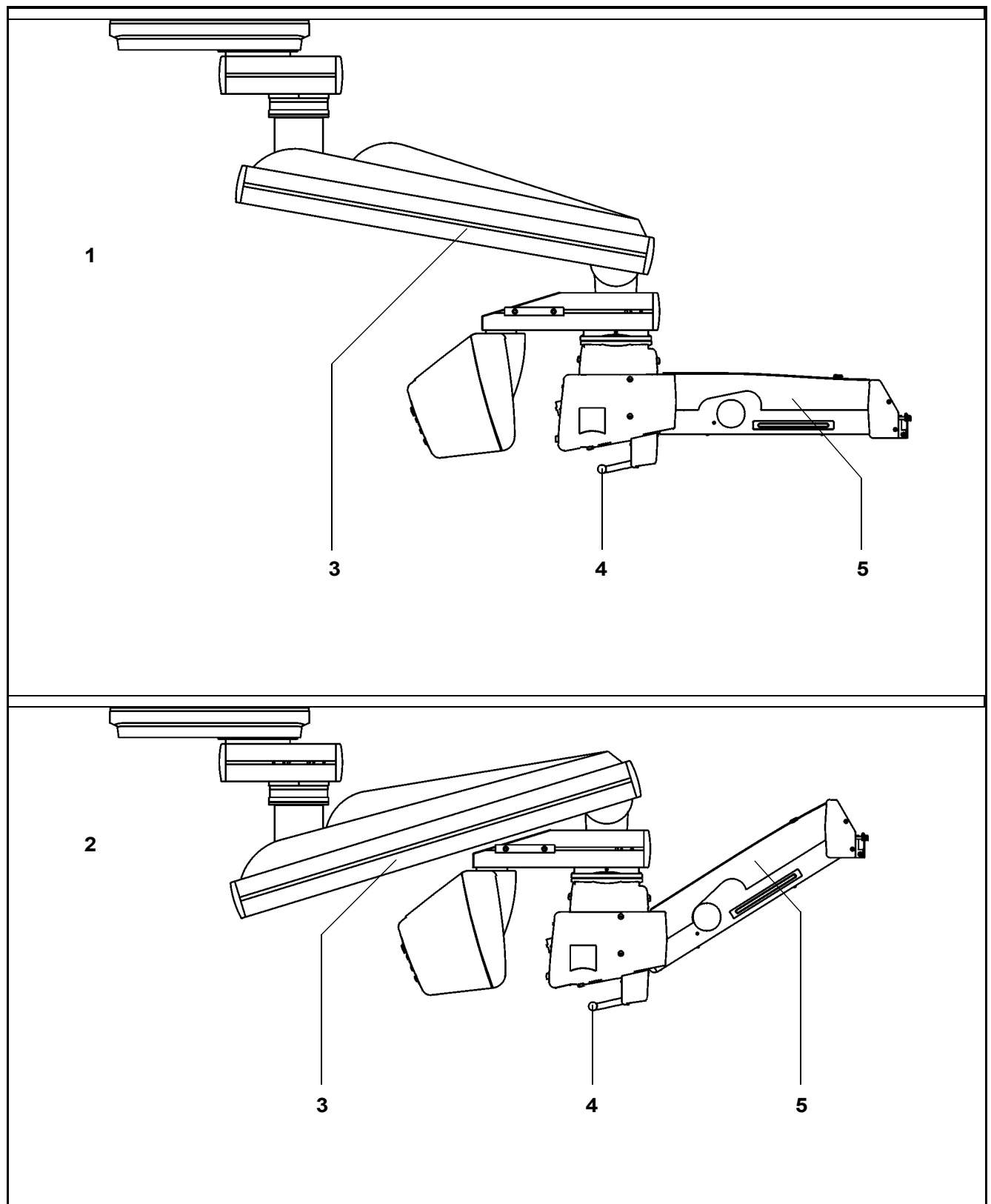
- 1 Working position
- 2 Standby position

Working position

- Pull the ceiling mount into the working position using the handle (4). The recommended height is approx. 1750 mm measured from the handle to the floor.
- When you release the handle (4), the lift arm (3) is locked in the working position (1).

Standby position

- Press the release key of the magnetic brakes on the surgical microscope. Move the suspension arm (5) to the highest possible position.
- Push the ceiling mount upward into the parking position using the handle (4). The standby position is the highest possible position.
- When you release the handle (4), the lift arm (3) is locked in the standby position (2).



Settings on the control and display panel

Setting up the suspension system

- Turn on the suspension system at its power switch.
- Successively select the following functions on the suspension system:
 - lamp brightness,
 - motor speeds for zoom,
 - focus and
 - X-Y coupling.
- Set the lamp brightness as follows:

Slowly increase the brightness until the necessary and still admissible level is reached.

 - Halogen: adjustment range: 0.5 ... 10
 - Xenon: adjustment range: 0.5 ... 10



Warning!

Too much light intensity (brightness setting is too high) or excessive radiation exposure times may lead to retinal injury in the patient's eye.

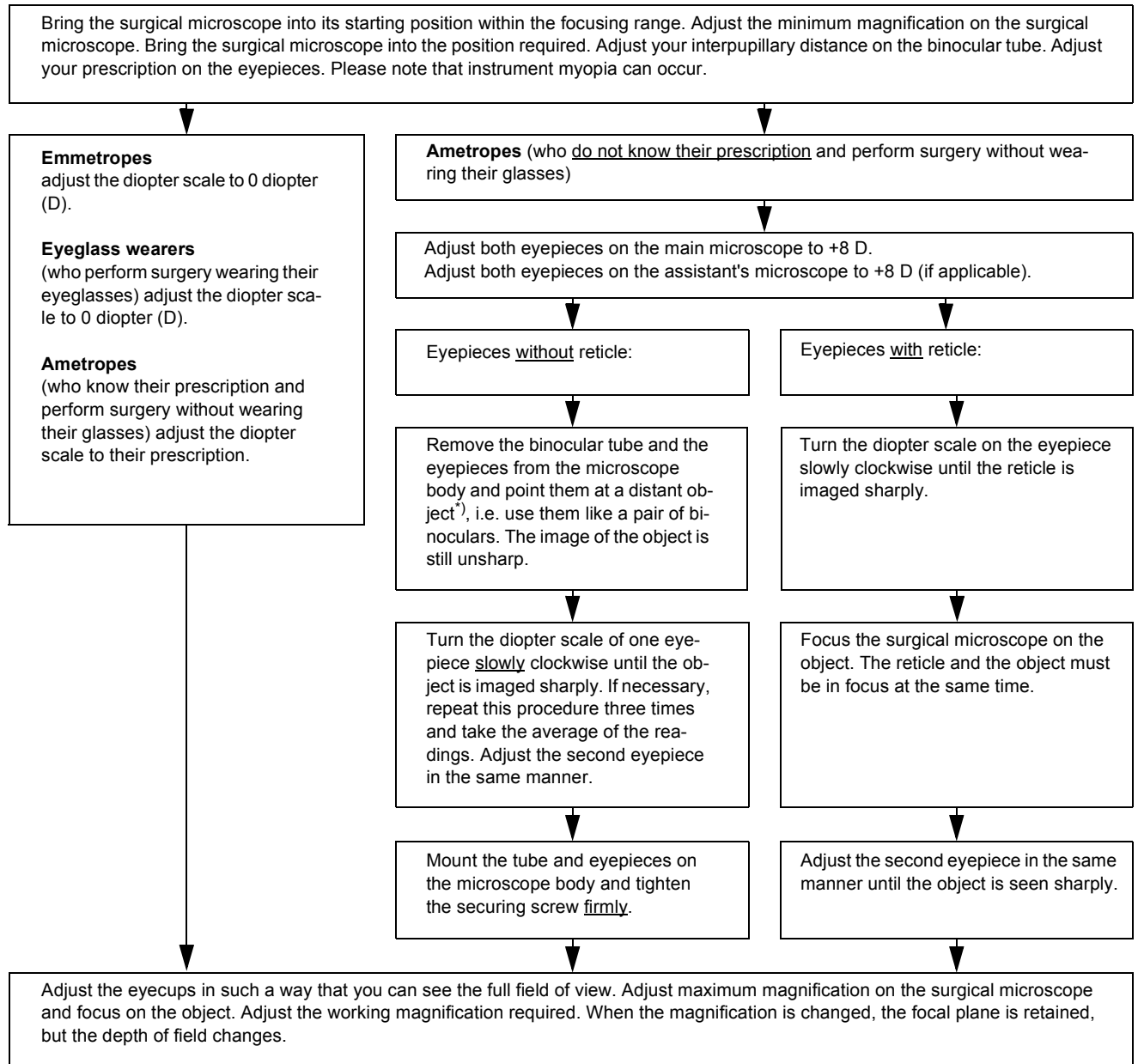
- Adjust the illumination intensity as required for the selected type of illumination and the radiation exposure time. You will find the values recommended by Carl Zeiss in the table "Maximum radiation exposure times" on page 29.
- Set the values required for
 - motor speeds of the functions zoom,
 - focus and
 - X-Y coupling.

Motor speed

Adjustment range: 1...10

Level 1 corresponds to the lowest, level 10 to the highest motor speed.

Adjusting the surgical microscope



Note: If several surgeons use the system, it is advisable to draw up a table with the individual prescriptions and to keep it in a handy location near the system.

***) CAUTION:** Never use the sun as the distant object!

Optimizing the red reflex

Optimization on the OPMI

For optimum visualization of the red reflex on the OPMI, please check that:

- the objective lenses are free from contamination,
- the light guide is undamaged and correctly connected,
- the lamp is properly seated in the lamp socket,
- all protection filters have been correctly swung into the beam path,
- the microscope is in the correct working position (the patient's eye must correspond with the optical axis of the microscope).

Optimization on the monitor

For optimum visualization of the red reflex on the monitor, please make the following settings:

- Activate the integral light metering function of the camera to reduce reflections from the sclera and cornea. (See user manual for the camera.)



Caution:

If the camera adapter is equipped with an iris diaphragm, the latter should be removed prior to ophthalmic applications. (See user manual for the camera.)

- Increase the brightness of illumination, if necessary.

Adjusting the tilt angle

Using knob (1), you can position the surgical microscope in a range from +90° to -90° (+ in the direction of the surgeon and - in the opposite direction). The +90° setting is ideal for surgery on patients in a seated position or lying on their side.



Caution:

Do not tilt the main microscope beyond + / -90°, as this could damage the microscope cable or the light guide.

- Turn knob (1) until the surgical microscope is in the viewing position required.

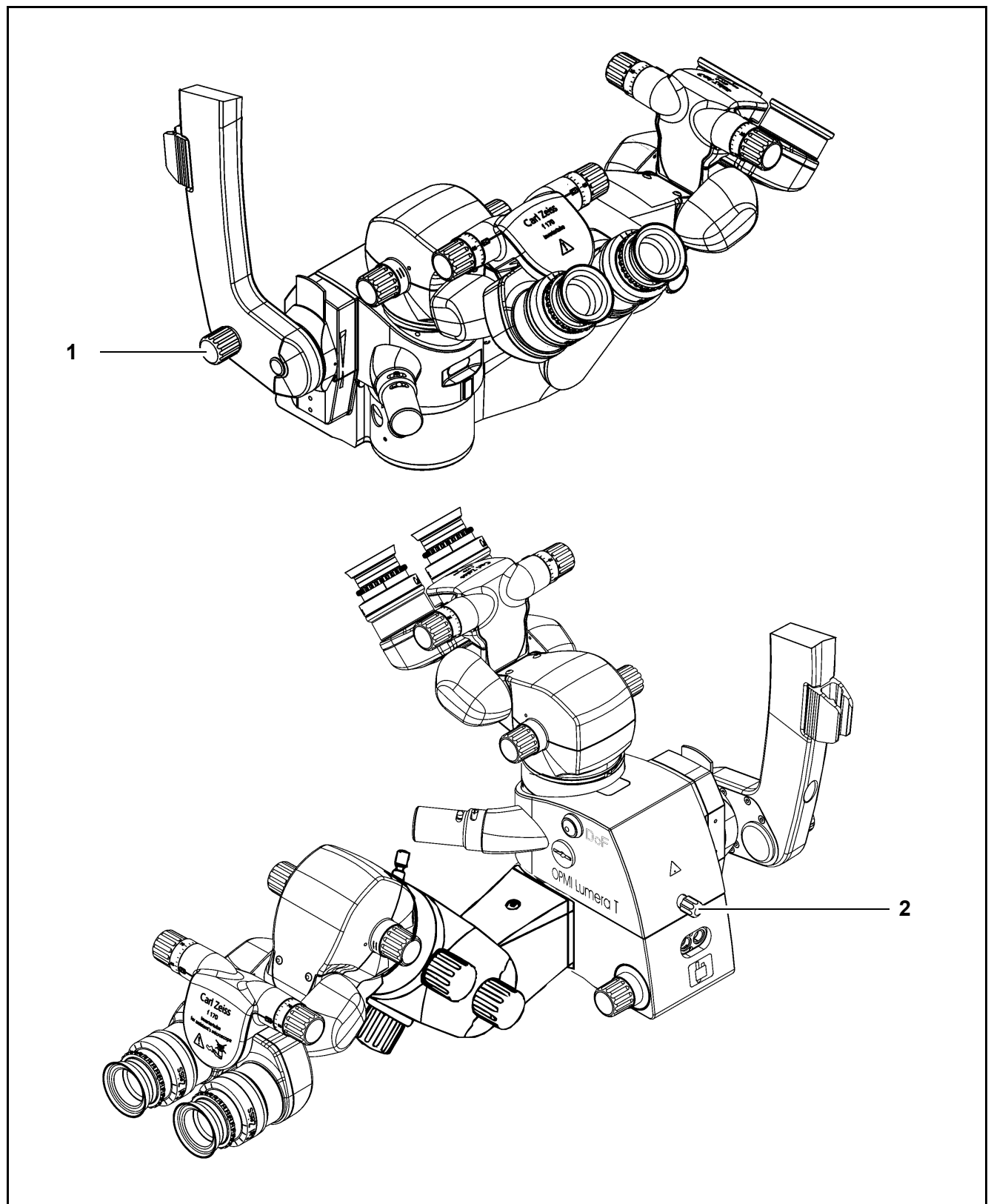
After the viewing angle has been set, the surgical microscope remains in this position. The gear drive is self-locking.



Warning!

- To prevent the integrated assistant's microscope from moving downward of its own accord when the main microscope is being tilted, the integrated assistant's microscope must be adjusted and locked in position using screw (2) before surgery.
- Check that the integrated assistant's microscope is firmly seated.
- Do not tilt the main microscope beyond + / -90°, as this could damage the microscope cable or the light guide.
- Using locking screw (2), secure the integrated assistant's microscope in the selected working position (on the left or right of the main microscope).
- Turn knob (1) until the surgical microscope is in the viewing position required.

After the viewing angle has been set, the surgical microscope remains in this position. The gear drive is self-locking.



Preparing the system for sterile use

Asepsis sets

For sterile use, the system can be equipped with resterilizable products. The asepsis sets available from Carl Zeiss contain caps and handgrips which can be sterilized in autoclaves. For detailed information on sterilization please see the enclosed instructions "Preparation of resterilizable products".



Warning!

The products contained in the asepsis sets must be cleaned, disinfected and sterilized before each use. This also applies to the first use after delivery.

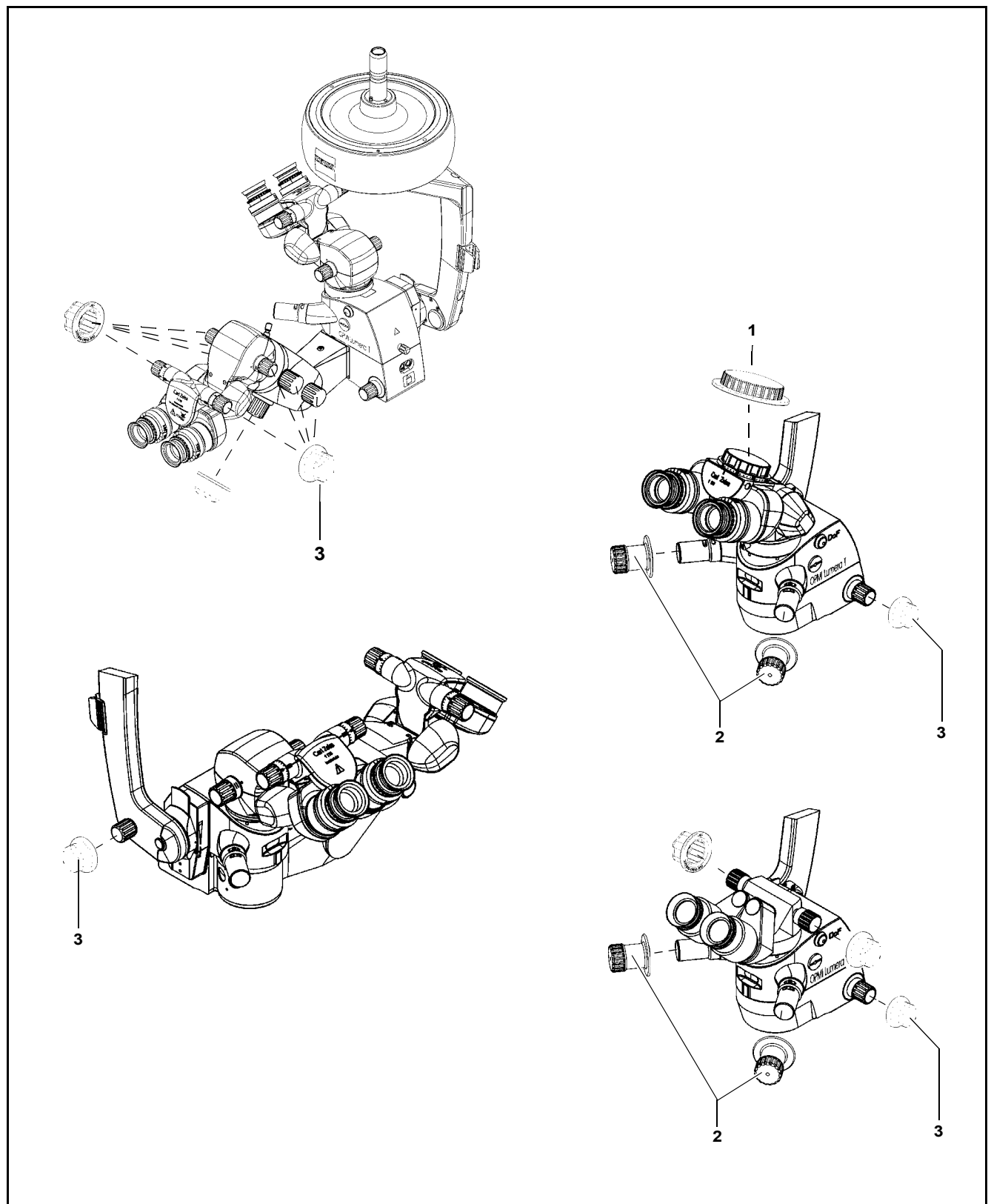
The following asepsis caps can be fitted on the controls of the surgical microscope and tube:

- 1 Sterilizable cap
for the PD knob (adjustment of the interpupillary distance)
- 2 Sterilizable cap
for handgrips
- 3 Sterilizable cap
for control knobs with 22 mm diameter

Drapes

Sterile single-use drapes are available to cover the system.

When draping the system, make sure there is enough slack in the drapes to allow for movement of the microscope carrier and surgical microscope. It is especially important that the drapes are completely loose around the handgrips. The surgeon must be able to operate the controls through the drape.



Operation

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Checklist



Warning!

If a function fails, you must not use this instrument for safety reasons. Correct the fault (see the "Troubleshooting table") or contact our service dept.

Always check the function of the system before surgery (without patient!) using the following checklist:

Requirements:

- Check that the correct rated voltage has been set on the suspension system.
- Check that all cables have been connected.
- Check that the light guide has been connected.
- Check that the protective cover has been removed from the microscope's objective lens
- Turn on the system at the power switch of the suspension system.

Checking the surgical microscope

Check the zoom function

- Press the appropriate button on the foot control panel.

Check the focusing function

- Press the appropriate button on the foot control panel.

Friction adjustment of the surgical microscope

- Check that the friction of the surgical microscope's rotation has been adjusted as required using the friction adjustment knob on the suspension system.

Speeds of the microscope functions

- Check that the speeds of the microscope functions have been adjusted as required on the suspension system.

Eyepieces / binocular tube

- Check that the surgical microscope and the tube are in a position convenient for you.
- Check that the correct interpupillary distance has been set.
- Check that the eyecups have been adjusted in such a way that you can see the full field of view.
- Check that the correct prescription has been set on the diopter scale.

- Check that image quality is the same throughout the entire magnification range.

Check the accessories

Using the manuals provided, check that the other equipment (illumination system, video system, etc.) is functioning properly.

Checking the suspension system



Note:

After switching on, the suspension system automatically performs a self-test which takes approx. five seconds.

The suspension system is equipped either with a halogen light source, a Superlux Eye light source or with a Superlux Eye light source with an additional, integrated halogen light source (option).

Lamp brightness (halogen, xenon)

- Check that the lamp brightness display shows the minimum level (0.5) after power-on of the system.
- Change the lamp brightness across the entire control range, and check that brightness variation has an effect on the surgical field illumination (bright/dark).

Halogen light source

- The halogen light source is on and the green indicator lamp is lit.
- The halogen lamps including the backup lamps are intact, i.e. the yellow indicator lamp is not lit.

Superlux Eye light source

- A beep sounds after power-on of the system, and stops when the xenon lamp has ignited correctly and if no other error has occurred.
- If the beep does not stop, the system must not be used.
- The xenon lamp is on and the green indicator lamp is lit.



Note:

If the first lamp has failed and the backup lamp is in use (red segment in the switching knob lights up), make sure to have a backup lamp module ready at hand as a precaution.

**Warning!**

The xenon lamp has a limited service life of 500 h.

If used beyond its maximum service life, the xenon lamp may explode.

- Replace the xenon lamp in good time.
- Reset the service hour counter to "0" after replacing the lamp.
- For the lamp change procedure and how to reset the service hour counter, see "Switching to the backup lamp" on page 38.

Balance setting

- Check that the suspension arm has been properly balanced. When the release button on the surgical microscope is pressed, the effort required to move the arm up or down must be the same.

Limitation of downward travel

- The minimum working distance (height) from the surgical field has been set using the adjustment screw for limiting downward travel.

S88 floor stand only: Stand base

- Check that the brake tab has been pressed and that the stand is securely locked in position.

Check the accessories

- Using the manuals provided, check that the other equipment (surgical microscope, coobservation tube, video system, etc.) is functioning properly.

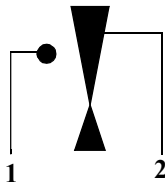
Checking the foot control panel

- Check that the plug of the foot control panel has been connected.
- Check that the power switch of suspension system has been switched on.
- Check that all functions assigned to the respective buttons on the foot control panel are working properly.

When using a wide-angle observation system (e.g. BIOM 3)



Risk of collision!



When using a wide-angle observation system (e.g. BIOM 3 from Oculus) which is usually installed between the surgical microscope and the patient, make sure that the patient is neither put at risk nor injured by the motorized focusing system or the movement of the suspension system arm.

Only use accessories expressly certified by the manufacturer for combination with the surgical microscopes described in this manual.

Warning!

- With the wide-angle observation system swung out of position, always position the microscope body in such a way that index dot (1) of the microscope's focus is in the middle of triangle (2) of the marking.
- Select a medium magnification (e.g. 1.0).
- Lower the surgical microscope toward the surgical field until you see the patient's cornea sharply defined.
- Turn the locking lever for limiting the downward movement clockwise as far as it will go and check without the patient that the suspension arm cannot be lowered any further.
- It is vital that you read the user manual for the wide-angle observation system used (e.g. BIOM 3 from Oculus).

Positioning the S88 floor stand



Note:

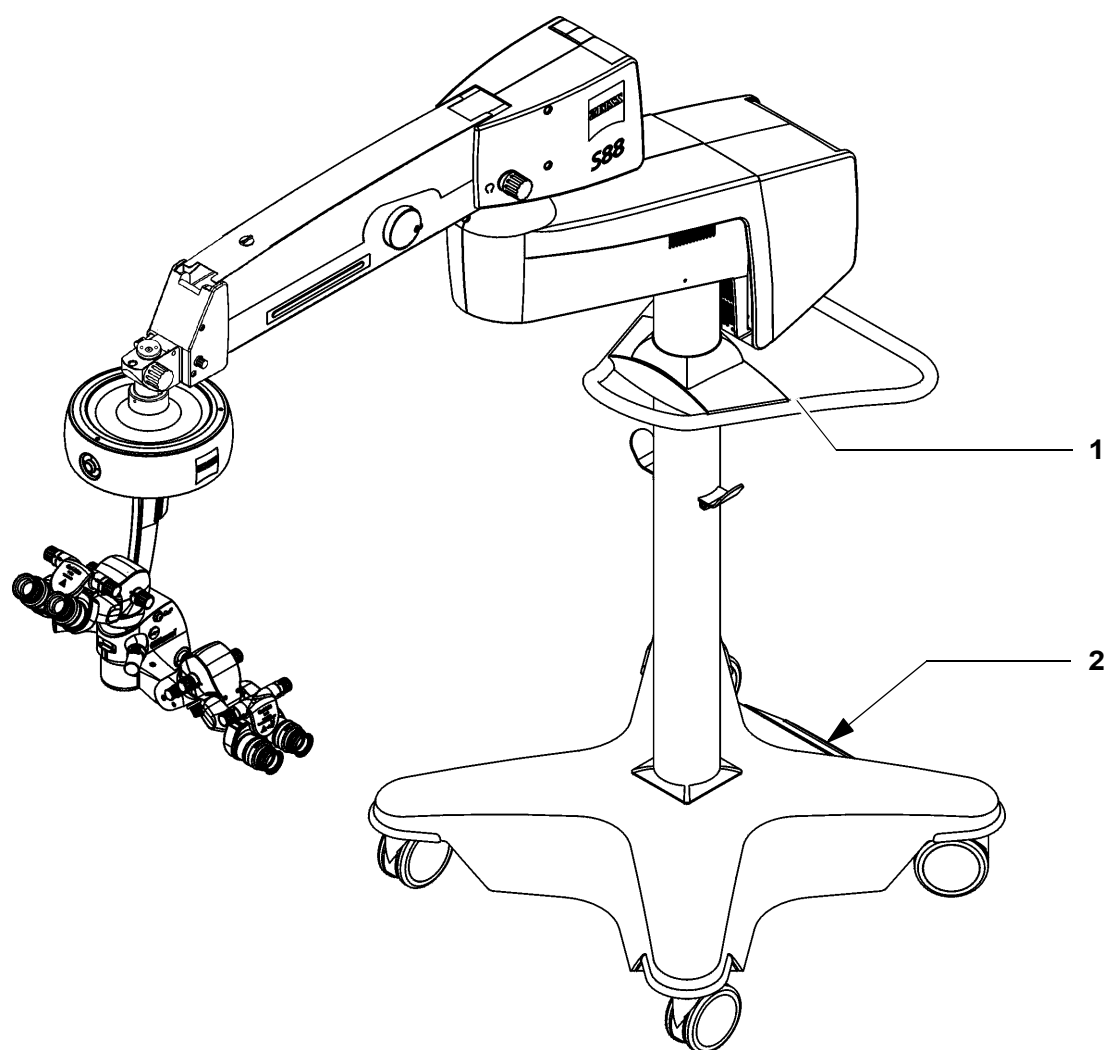
Please also read the chapter: "Relocating the stand", page 162.

- Unlock brake tab (2).
- Use maneuvering handle (1) to move the stand to the site of use.
Make sure that movement is not obstructed by the power cord and the cable of the foot control panel.



Caution:

Press down brake tab (2) and make sure that the stand is securely locked in position and cannot roll away by itself.

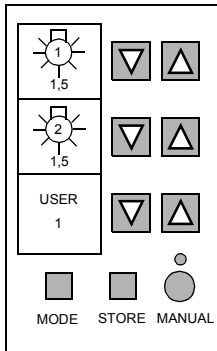


Using the display and key field

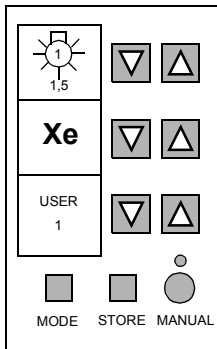
General functions

Basic mode

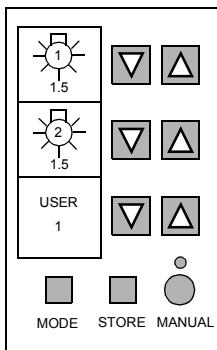
Halogen



Xenon



Xenon with halogen (option)



Operating keys "▽" and "△"

Keys "▽" and "△" always refer to the display field (LCD) on the left, i.e. you can use them to change the values or settings currently displayed in this field.

Every time you press the "▽" key, the displayed value is decremented in predefined steps down to a certain minimum.

Every time you press the "△" key, the displayed value is incremented in predefined steps up to a certain maximum.

Keys "△" and "▽" have a repeat function, i.e. if you hold down these keys, the relevant value is automatically incremented or decremented by the predefined steps until the maximum or minimum value is reached.

Operating the row of keys

"MODE" key

Press the "MODE" key to switch from the basic mode to the speed mode. The "MODE" key also brings you back from the speed mode to the basic mode.

In the configuration modes, use the "MODE" key to return to the basic mode.

"STORE" key

The function of the "STORE" key is dependent on the surgical microscope used. For details of the "STORE" key, see the user's manual of the relevant surgical microscope.

"MODE" key and "STORE" key

If you press the "MODE" and "STORE" keys simultaneously, you will get from the basic mode to the configuration mode 1. If you press the "MODE" and "STORE" keys simultaneously while you are in one of the configuration modes, the program jumps to the next configuration mode, and from the last configuration mode back to configuration mode 1, see the illustration "Overview of user interface".

Note:

If you have selected any of the modes and do not press a key in the key field, the program will return to the basic mode after 20 seconds.

"MANUAL" key

The "MANUAL" key permits you to switch to manual operation. The motorized control functions of the surgical microscope are deactivated. The lamp brightness is automatically adjusted to a fixed setting, the value being shown in the first display.

When the manual mode is activated, the yellow LED is lit and the word "MANUAL" blinks in the third display.

The surgical microscope can no longer be operated via the foot control panel, the handgrips or the display and key field.

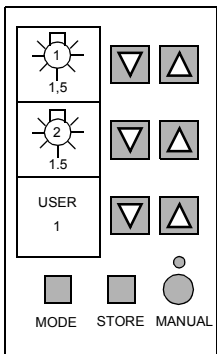
In the manual mode, you can only switch the illumination on and off on the foot control panel and release the magnetic brakes by pressing the appropriate keys on the surgical microscope.

The selection of the manual mode is retained even if you turn the power switch of the instrument off and on again.

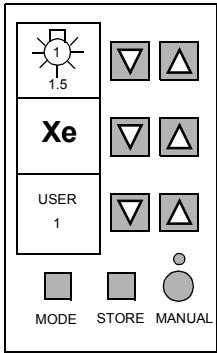
Press the "MANUAL" key once again to reactivate electronic control; the display in the display and key field then returns to the basic mode.

Basic mode

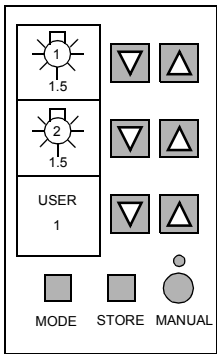
Halogen



Xenon



Xenon with halogen (option)



Basic mode

The basic mode is always displayed in the normal operating status.

In the basic mode, the following settings are displayed, depending on the installed surgical microscope:

In the upper display field	the current lamp brightness
In the middle display field	Halogen: backup lamp Xenon: Xe Xenon with additional integrated halogen light source (option): halogen
In the lower display field	the user ID

Setting the user ID (USER)

Every time you switch on the system, the basic mode is automatically displayed.

In the basic mode, the lower display field generally shows the current USER, i.e. the user ID selected when the system was last switched off is displayed. When the system is switched on, all settings for this user will be activated, Exception: the lamp brightness, which is always set to the minimum value.

User data records can be stored for a maximum of 9 different users.

Keys "▽" and "△" assigned to the lower display field permit you to select a user ID between 1 and 9.

Saving parameter settings

As soon as you have entered a parameter setting, it is saved under the current user ID.

Note:

If possible, each user should be assigned his own user ID under which he can enter and save his specific parameter settings. This permits each user to call up his specific set of parameters via his user ID and to work with these settings.

Caution:

Make sure never to change the settings of another user. It is therefore advisable that you only use your own user ID for your work. Remember that all settings made are stored under the user ID currently selected.

Note:

For the Superlux Eye light source with integrated halogen light source (option), the lamps are numbered as follows:

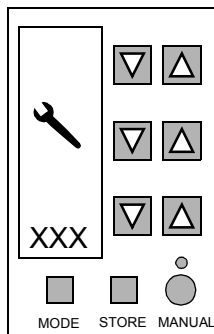
Lamp 1: xenon

Lamp 2: halogen

Acoustic signals

Three successive beeps	<ul style="list-style-type: none"> – Error message during the software check after power-on of the suspension system. – Error message for an internal system error.
One beep	When the focus or zoom position is saved.
One beep	After power-on of the suspension system.
Intermittent beep	Light source failure.

Service display



In the event of an error, e.g. during the software check after power-on of the suspension system, an error message appears in the control and display panel: a wrench symbol and an error code (XXX) are displayed and three successive beeps are heard.

Inform the service department, telling them the error code and the serial number of the system.

Motorized control of the surgical microscope is then no longer possible. All microscope functions except recentering of the X-Y coupling can only be operated manually.

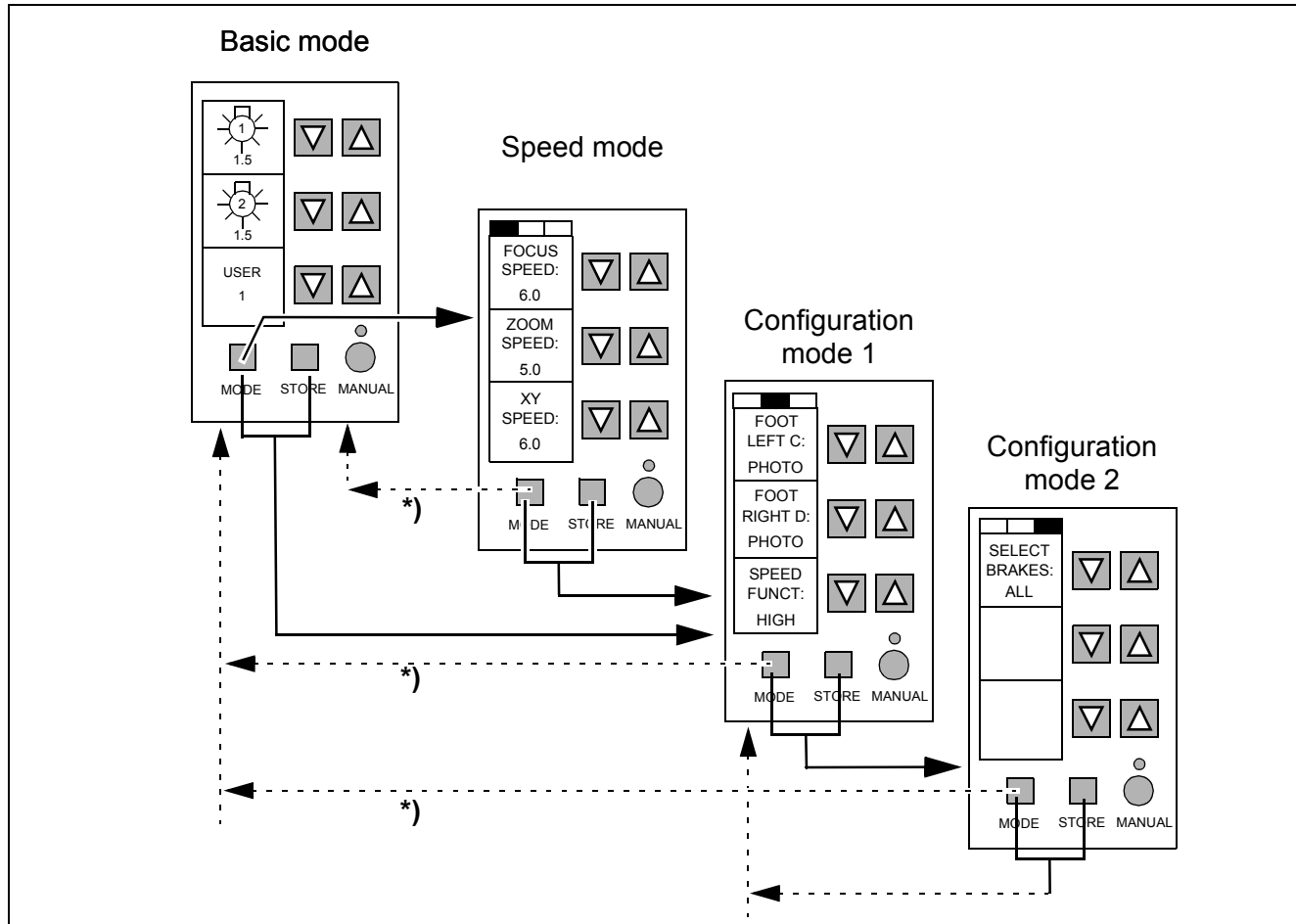
However, you can still release the magnetic brakes using the appropriate button on the left and right handgrips of the microscope.

When you press the "MANUAL" button, the surgical microscope can no longer be operated via the foot control panel, the handgrips or the control and display panel.

You can continue using the light source, but the lamp brightness is automatically adjusted to a fixed setting. You can use the foot control panel to switch the light source on and off.

Operating the OPMI® on the suspension system

Overview: user interface for the OPMI®



Key for the overview:

→ Next

← Back

*)

If no key is pressed within 20 seconds, the program automatically returns to the basic mode.



Note:

The illustration shows the factory-adjusted default values to which you can reset your specific settings if required.

Control functions for the OPMI®

The control functions for the OPMI® have been combined in 4 modes:

Basic mode

- Setting the lamp brightness
- Setting the user ID

Speed mode

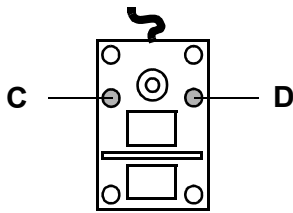
- Setting the speed for focusing
- Setting the speed for the zoom function
- Setting the speed for the X-Y coupling

Configuration mode 1

- Assigning a function to button C of the foot control panel
- Assigning a function to button D of the foot control panel
- Setting the focus speed depending on the zoom setting

Configuration mode 2

- Setting the magnetic brakes to be released by activating the release button in the handgrip.



The control functions are explained in more detail in the following sections.

"STORE" key

In the basic mode and speed mode, the current zoom setting of the surgical microscope can be stored for the user currently selected.

The "STORE" key has no function in the configuration modes.

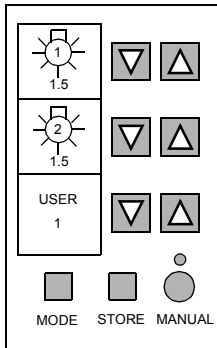
The current zoom value is saved as zoom memory (ZOOM-MEM). You can set the instrument to this stored zoom value by pressing key C or D on the foot control panel if the XYZ-RES function has been assigned to one of these keys in configuration mode 1. You can also set the stored zoom value using the RESET key on the X-Y coupling.



Caution:

Be extremely careful when changing these settings. You should change settings only under your own user ID. Notify all users of any changes, or make sure that each user only works under his own user ID.

Basic mode

**OPMI®: setting the lamp brightness**

This function permits you to set the lamp brightness.

In the basic mode, the lamp brightness currently set is shown in the upper display field.

The middle display field remains empty and the associated keys "▽" and "△" have no function.

If the suspension system is equipped with a second halogen lamp housing, the brightness currently set for the second lamp is displayed in the middle display field.

Path: The basic mode is automatically displayed after the instrument has been switched on.

Adjusting the settings

Keys "▽" and "△" allow you to change the lamp brightness.

- Check that the lamp brightness can be varied and that brightness variation has an effect on the surgical field illumination. Perform this check across the entire control range. The brightness can be adjusted in the following ranges:
 - Halogen: 0.5 ... 10 in steps of 0.5
 - Xenon: 0.5 ... 10 in steps of 0.5

**Warning!**

Too much light intensity (brightness setting is too high) or excessive radiation exposure times may lead to retinal injury in the patient's eye.

- Adjust the illumination intensity as required for the selected type of illumination and the radiation exposure time. You will find the values recommended by Carl Zeiss in the table "Maximum radiation exposure times" on page 29.

Acoustic signals for the Superlux Eye light source

- One beep is emitted when the suspension system is switched on. This beep is only used as a check for the loudspeaker function.
- If several successive beeps are emitted and the xenon lamp is lit when the system is switched on, this indicates a malfunction of the light source.
- Attach a sign to the system stating it is out of order and contact our service representative.

**Warning!**

Software and hardware failure may increase the brightness of the Superlux Eye light source, leading to retinal injury in the patient's eye.

If several successive beeps are emitted and the xenon lamp is lit when the system is switched on, this indicates a malfunction of the Superlux Eye light source.

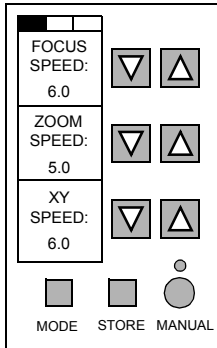
- Attach a sign to the system stating it is out of order and contact our service representative.

Saving the settings

As soon as you have made a setting, the setting is accepted and saved under the current user number.

Exception: the brightness setting cannot be saved. It is reset to level 0.5 at the next power-on of the system.

Speed mode

**OPMI: Setting the adjustment speeds**

You can set the adjustment speeds for the following microscope functions:

- Focusing
- Zoom function
- Adjustment of the X-Y coupling

Path: The basic mode is automatically displayed after the instrument has been switched on.

Press the "MODE" key to access the speed mode.

Changing the settings

The speed mode is the user interface where you can select the speeds of the surgical microscope functions.

Use the "▽" and "△" keys to change the settings in steps.

Each of the three adjustment speeds is variable in a range from 1 (minimum) to 10 (maximum) in steps of 0.5.

With low zoom values, optical systems have a large depth of field and the focusing system has to cover a large adjustment range until the image is sharply defined. The X-Y coupling needs to be adjusted within a wide range until the position required is reached. This takes a certain time, and a high adjustment speed is therefore of advantage in this case.

With high zoom values, on the other hand, optical systems have a small depth of field. The focusing system has to be precisely positioned to obtain a sharply defined image, and the X-Y coupling needs to be precisely adjusted within a narrow range to reach the position required. A low adjustment speed is therefore preferable here.

Select the focusing speed which suits your specific work method.

Note:

The "SPEED FUNCT" function in configuration mode 1 permits you to select dynamic speed control for focusing and for the X-Y coupling as a function of the zoom setting.

You can select a high, medium or low value for the dynamic change of speed, or deselect dynamic speed control.

If you have already set a high adjustment speed for focusing and the X-Y coupling in the speed mode, dynamic speed control may possibly not be effective across the entire zoom range, as the maximum adjustment speed is reached beforehand. For further details, please see configuration mode 1.

Saving parameter settings

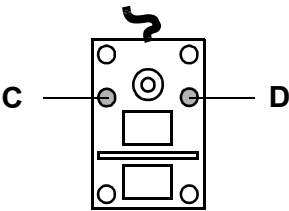
As soon as you have entered a parameter setting, it is saved under the current user ID.

**Caution:**

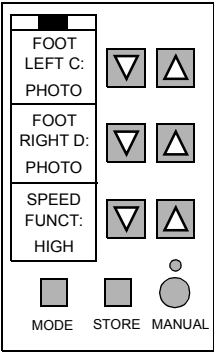
Be extremely careful when changing these settings. You should change settings only under your own user ID. Notify all users of any changes, or make sure that each user only works under his own user ID.

Path: To return to the basic mode, press the "MODE" key in the speed mode or do not press any key for 20 seconds.

To switch to configuration mode 1, simultaneously press the "MODE" and "STORE" keys.



Configuration mode 1



OPMI: Assigning a function to buttons C and D of the foot control panel

Buttons C and D of the foot control panel can be configured as required.

In configuration mode 1, the upper and middle display and key fields permit you to assign one of the following functions to buttons C and D:

Display	Function of button C or D of the foot control panel		
XY-RES	RESET of XY (recentering) and focus		
XYZ-RES	Recentering of XY, reset of focus and zoom		
FOC-MEM	Focus memory	pressed for < 2 sec:	triggers positioning
		pressed for > 2 sec:	saves position
XY-INV	Inversion of direction of X-Y coupling on foot control panel		
SDI	Triggering of SDI switchover		
PHOTO	Camera release at the camera interface		
AUX	Triggering of an AUX signal at the AUX interface (see remote control socket on the suspension system's connector panel).		

The functions are explained in detail in the following.

Path: After you have switched on the instrument, the basic mode is automatically displayed.

To access configuration mode 1 from the basic mode, simultaneously press the "MODE" and "STORE" keys.

FOOT LEFT C:

Use the upper section of the display and key field (FOOT LEFT C:) to assign one of the possible functions to key C of the foot control panel.

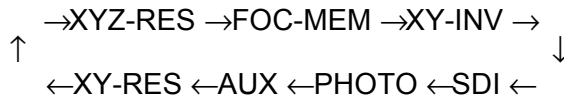
FOOT RIGHT D:

Use the middle section of the display and key field (FOOT RIGHT D:) to assign one of the possible functions to key D of the foot control panel.

Roll-over procedure

Use the "Roll-over procedure" to select the required function in the default sequence of the above table.

Every time you press the relevant button "▽" you advance clockwise. Every time you press the relevant button "△" you advance counterclockwise.



If you have assigned FOC-MEM to key C or D of the foot control panel, you can determine by the length of time for which you press the relevant key of the foot control panel during operation whether a positioning run is to be triggered (press the key for less than 2 seconds) or whether the current position is to be saved (press the key for more than 2 seconds).

**Caution:**

Be extremely careful when changing these settings. You should change settings only under your own user ID. Notify all users of any changes, or make sure that each user only works under his own user ID.

Saving parameter settings

As soon as you have entered a parameter setting, it is saved under the current user ID.

Path: To return to the basic mode, press the "MODE" key in configuration mode 1 or do not press any key for 20 seconds.

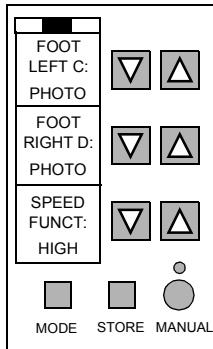
To switch to configuration mode 2, simultaneously press the "MODE" and "STORE" keys.

Explanation of the assignable functions:

XY-RES	The X-Y coupling moves to its center position and the focus adopts its initial position in the focusing range.
XYZ-RES	The X-Y coupling moves to its center position, the focus adopts its initial position in the focusing range and the zoom system adopts a position previously saved using the STORE key.
XY-INV	Inverts the movement direction of the X-Y coupling. This is a useful function when you are using an image inverting system in vitreo-retinal surgery. All you have to do is press one of the two buttons (C or D) on the foot control panel to invert the movement direction of the X-Y coupling.

SDI	<p>The optical system of the Stereo Diagonal Inverter (SDI) 2E from Oculus is moved into and out of the beam path of the surgical microscope.</p> <p>Movement control of the VISULUX(tm) fiber slit illuminator.</p>
FOC-MEM	<p>Press the appropriately configured button for more than 2 seconds to save a new focus position. A beep sounds when the position has been saved.</p> <p>To move to a saved focus position, briefly press the appropriately configured button (for less than 2 seconds).</p> <p>You can stop this process at any point by tipping on the appropriate button (C or D) on the foot control panel or on one of the direction keys (joystick or one of the two toggle switches).</p>
AUX	Triggers an AUX signal, e.g. to switch an external device on/off
PHOTO	Triggers the shutter of a connected 35-mm camera.

Configuration mode 1



OPMI: Setting the adjustment speeds of focus and X-Y coupling as a function of the zoom setting

In this mode, you can select dynamic speed control for focusing and the X-Y coupling.

The depth of field of the optical system changes as a function of the zoom setting:

- If a large field of view (low zoom value) is used, this results in a large depth of field, and the focus must be adjusted over a wide range to obtain a sharp image. The X-Y coupling therefore needs to be adjusted within a wide range to reach the position required. This means that high adjustment speeds should be used in this case.
- A small field of view (high zoom value), on the other hand, results in a small depth of field, and the focus has to be precisely set within a small range to achieve sharp image definition. The X-Y coupling therefore needs to be precisely adjusted within a narrow range until the position required is reached. This means that it is advisable to use low adjustment speeds for this purpose.

It is therefore a useful feature that the adjustment speed of the focus and X-Y coupling can be varied in accordance with the zoom setting.

The instrument has been factory-adjusted for HIGH variation of the adjustment speed as a function of the zoom setting. The best effect of dynamic speed control is achieved if an adjustment speed of 1.0 has been selected in the speed mode.



Note:

The dynamic speed control is based on the basic speed selected for focusing and the X-Y coupling in the speed mode.

If you have already set a high adjustment speed for focusing and the X-Y coupling in the speed mode, dynamic speed control may possibly not be effective across the entire zoom range, as the maximum adjustment speed is reached beforehand.

In the extreme case, if you have set the basic speed for focusing and the X-Y coupling to the maximum value of 10, dynamic speed control will have no effect at all.

In configuration mode 1, the bottom section (SPEED FUNCT:) of the display and key field permits you to select a high, medium or low value for the dynamic change of speed, or to deselect dynamic speed control:

HIGH
MEDIUM

LOW
OFF

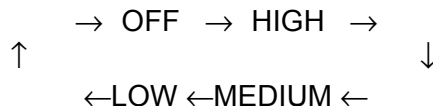
Path: After you have switched on the instrument, the basic mode is automatically displayed.

To access configuration mode 1 from the basic mode, simultaneously press the "MODE" and "STORE" keys.

Rollover

Select the function required using a rollover run in the sequence defined in the above table.

At each press of the "▽" key, you advance in clockwise direction. At each press of the "△" key, you advance in counterclockwise direction:



Caution:

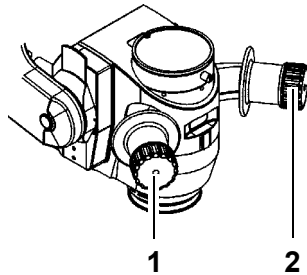
Be extremely careful when changing these settings. You should change settings only under your own user ID. Notify all users of any changes, or make sure that each user only works under his own user ID.

Saving parameter settings

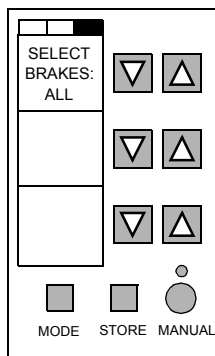
As soon as you have entered a parameter setting, it is saved under the current user ID.

Path: To return to the basic mode, press the "MODE" key in configuration mode 1 or do not press any key for 20 seconds.

To switch to configuration mode 2, simultaneously press the "MODE" and "STORE" keys.



Configuration
mode 2



OPMI®: Selecting the magnetic brakes to be unlocked

You can define which magnetic brakes of the suspension system are to be unlocked by turning the left and/or right handgrips (1) and (2) (turning function).

In configuration mode 2, the upper display and key field (SELECT BRAKES) permits you to select the following:

XY - Z	<p>The magnetic brakes of the suspension system for X-Y movement and Z movement can be unlocked separately. For this purpose, you must turn the left handgrip (1) or the right handgrip (2) to the left or right.</p> <ul style="list-style-type: none"> • To release the magnetic brakes for X-Y movement only: Turn the left handgrip (1). • To release the magnetic brakes for Z movement only: Turn the right handgrip (2). • To release all magnetic brakes, i.e. to release the magnetic brakes of the suspension system for XY and Z motion: Turn the left handgrip (1) and the right handgrip (2) at the same time.
ALL	<p>All magnetic brakes are always unlocked, i.e. the suspension system's magnetic brakes are unlocked for X-Y and Z movement, irrespective of whether you turn the left handgrip (1) or the right handgrip (2).</p>

Path: The basic mode is automatically displayed after the instrument has been switched on.

To access configuration mode 2 from the basic mode, go via configuration mode 1.

For this, simultaneously press the "MODE" and "STORE" keys twice in succession:

1. Jump from the basic mode to configuration mode 1
2. Jump from configuration mode 1 to configuration mode 2.

Selection

At each press of the "▽" or "△" key, the program jumps from one possible configuration to another.

Saving parameter settings

As soon as you have entered a parameter setting, it is saved under the current user ID.



Caution:

Be extremely careful when changing these settings. You should change settings only under your own user ID. Notify all users of any changes, or make sure that each user only works under his own user ID.

Path: To return to the basic mode, press the "MODE" key in the configuration mode or do not press any key for 20 seconds.
To access the next configuration mode 3, simultaneously press the "MODE" and "STORE" keys.

Procedure

- Switch on the power switch of the suspension system.



Warning!

Looking directly into the light source, e.g. into the microscope objective lens or light guide, may result in damage to the eye.

Avoid looking directly into the light source!

- Start with the lowest brightness setting on the suspension system and gradually increase brightness up to the necessary and still admissible level.



Warning!

Too much light intensity (brightness setting is too high) or excessive radiation exposure times may lead to retinal injury in the patient's eye.

Adjust the illumination intensity as required for the selected type of illumination and the radiation exposure time. You will find the values recommended by Carl Zeiss in the table "Maximum radiation exposure times" on page 29.

- Check the system using the checklist.
- Swing the surgical microscope over the surgical field into an ergonomic position within the working distance.
- Press the reset button on the X-Y coupling.
 - The X-Y coupling moves to its center position.
 - The focus adopts its initial position in the focusing range.
- Select the lowest magnification (zoom function on the foot control panel).
- Look through the eyepieces and lower the surgical microscope using the suspension arm until the surgical field comes into focus. This will result in coarse focusing.
- Select the highest magnification (zoom function on the foot control panel).
- Look through the eyepieces and activate the focusing function on the foot control panel until the microscope is sharply focused on the surgical field.



Note:

- If no red reflex is required, swing the retinal protection device into the beam path.

- When operating on the eye, use the blue barrier filter (retina protection filter). It protects the patient's retina against unnecessary (blue) radiation and permits the radiation exposure time to be increased by factor 3.
- Select the magnification required (zoom). Look through the eyepieces of the binocular tube. Adjust the eyepieces in such a way that you can see both the edge of the field of view and the microscope image sharply. Also see “Adjusting the surgical microscope”.
- Switch off the system when not in use.

What to do in the event of malfunctions

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What to do in an emergency

Lamp failure of the halogen light source

**Caution:**

Do not cover ventilation grid (2)! For example, drapes could be covering the grid. This can lead to overheating of the lamp modules and to lamp failure.

**Note:**

The lamp housing contains a backup lamp which is automatically swung into the illumination beam path when the first lamp fails. Open flap (3) and yellow indicator lamp (7) indicate that the backup lamp is being used.

Manual switching to the backup lamp

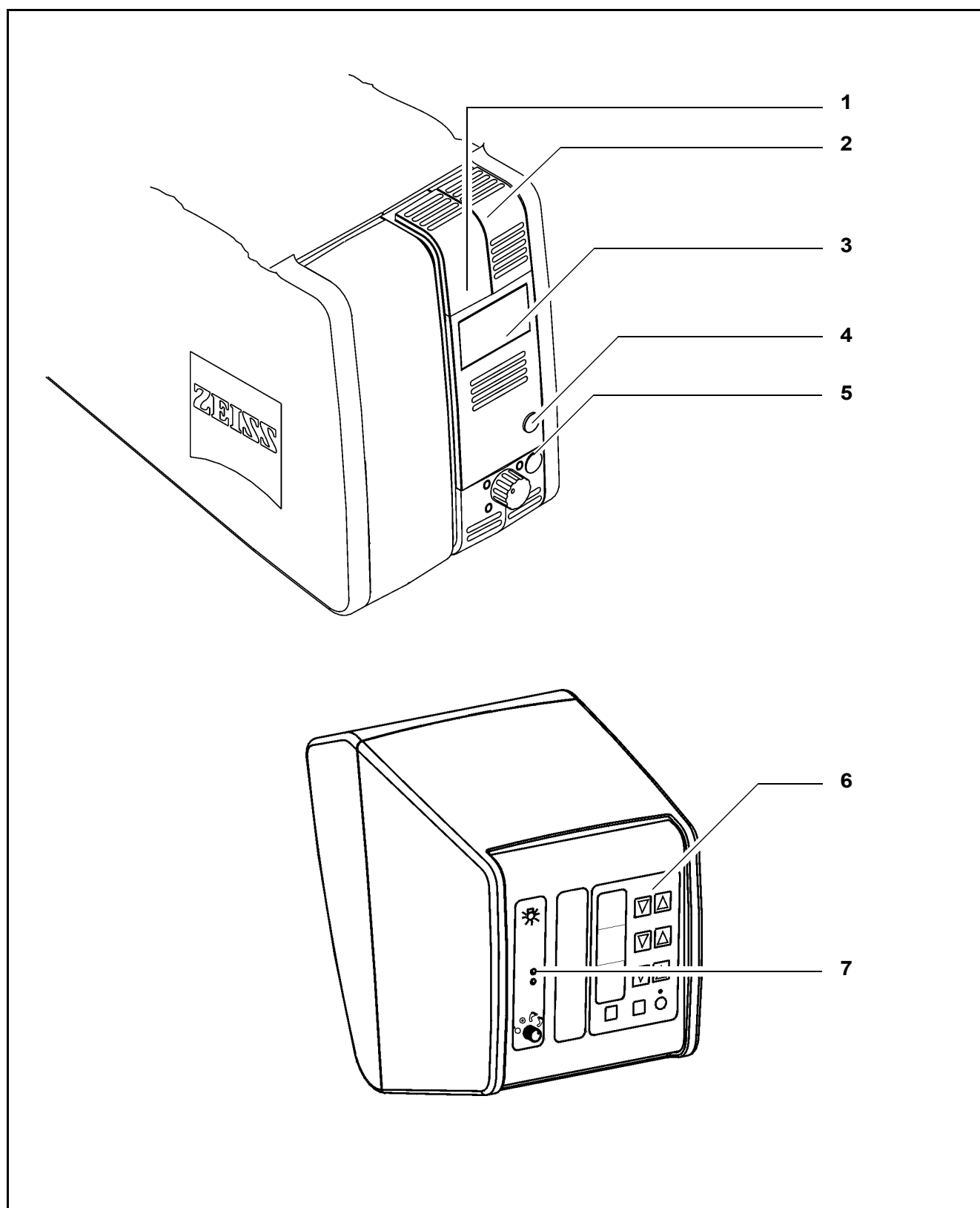
Press button (4) to manually activate the backup lamp.

If the backup lamp fails:**Warning!**

If you change the lamp shortly after it has failed, the lamp will still be very hot. Wear heat-protection gloves to avoid burns!

- Turn off the suspension system at the power switch.
- Press button (5) to slightly eject lamp module (1). Pull out the lamp module and replace the lamp, or insert the lamp module of the second light source.

Switch the suspension system back on. Adjust the brightness of the light source on display field (6) as required.



Lamp failure in the Superlux Eye light source

**Warning!**

Lamp rupture (audible as a loud bang) may lead to jamming of the lamp module and/or failure of the electronics modules.

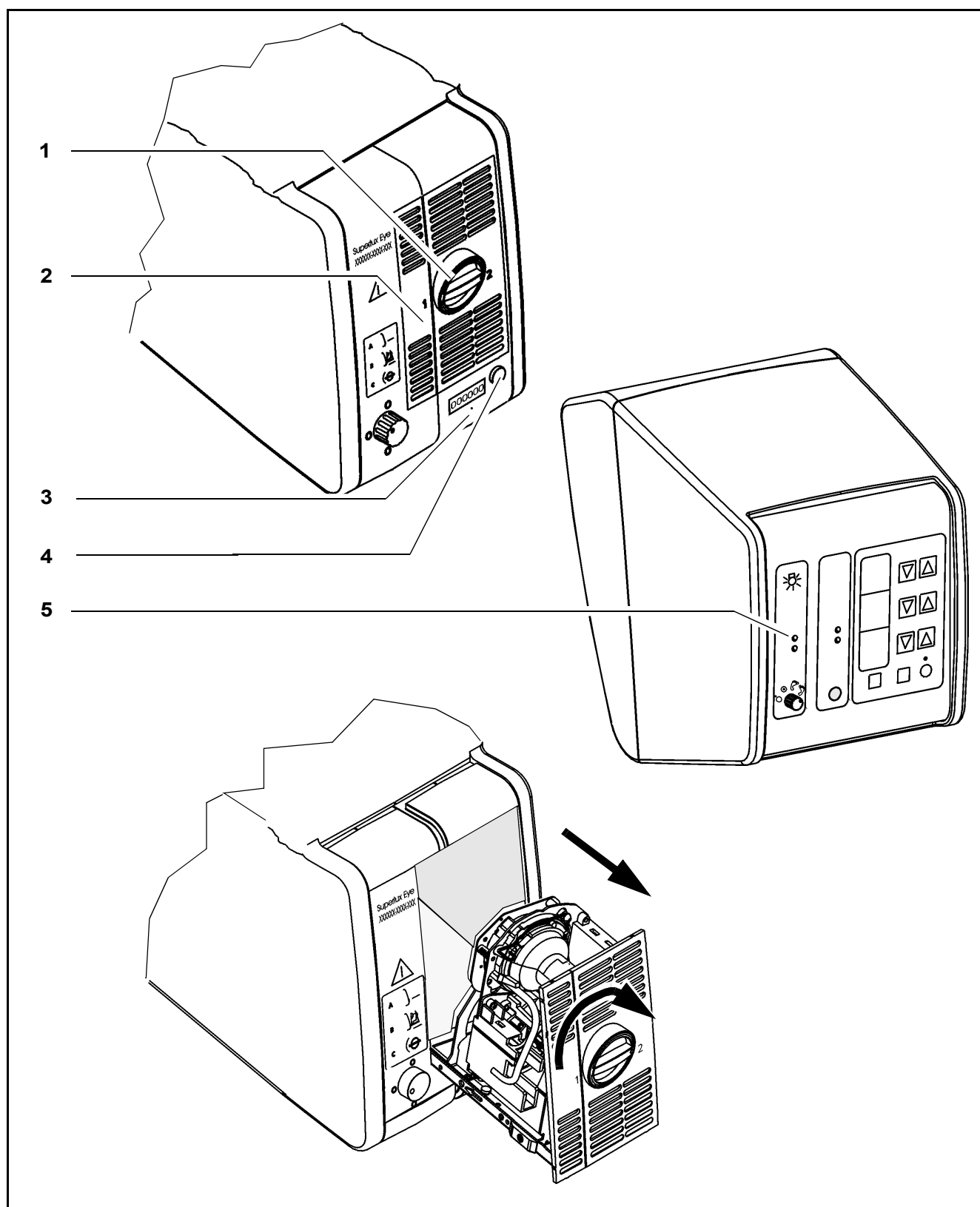
- Before opening the lamp housing, make sure that the system is moved to a position where neither the patient nor the user is put at risk by falling items.
- Do not continue using the system if the lamp module is jammed or the illumination is no longer operational due to defective electronics modules. Inform our service department.

**Caution:**

Do not cover the ventilation grid! For example, drapes could be covering the grid. This can lead to overheating of the lamp module and to lamp failure.

**Note:**

Yellow indicator lamp (5) lights when the lamp has failed, or if the lamp module is defective. After activation and ignition of the backup bulb, the yellow indicator lamp turns off again.

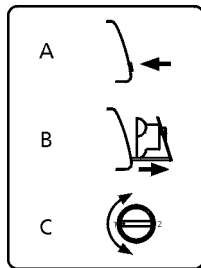


Switching to the backup lamp

- Turn off the suspension system at the power switch before switching to the backup lamp.

The lamp module contains two xenon lamps. The second lamp is used as a backup lamp which can be swung into the illumination beam path when the first lamp fails.

If the first xenon lamp fails, you can open lamp module (2) as follows:

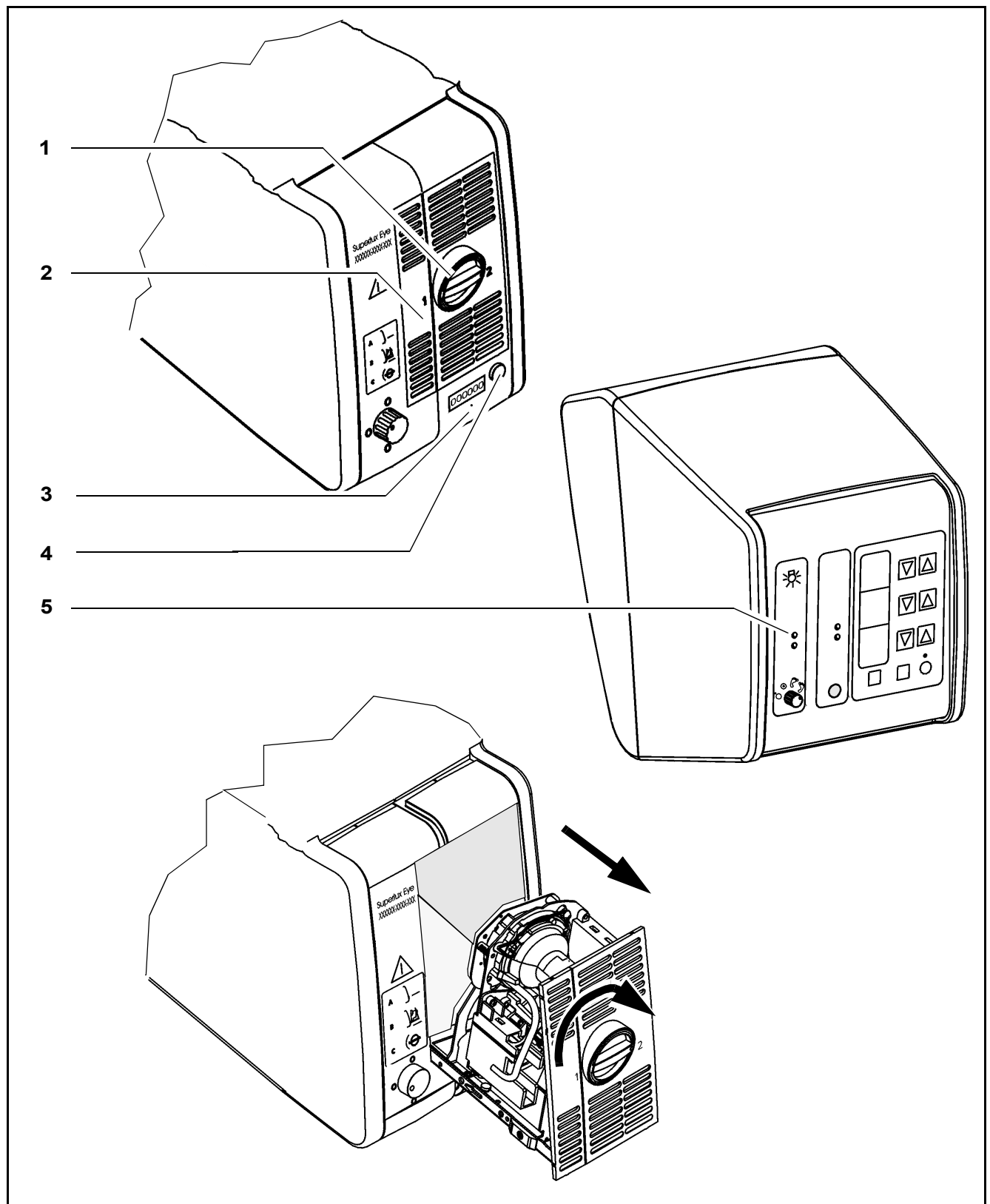


- Press button (4). The lamp module is slightly ejected.
- Pull out the lamp module as far as it will go.
- Turn knob (1) through 180° until it snaps in. This swings the second xenon lamp (backup lamp) into the beam path.
- Push the lamp module all the way back into the lamp housing.
- Reset the service hour counter to "0". Use a pointed object and press it into the recess of reset button (3).
- Turn the suspension system back on at the power switch.



Note:

If the first lamp has failed and the backup lamp is in use (red segment in knob (1) lights up), make sure to have a backup lamp module ready at hand as a precaution.



Failure of lamp control



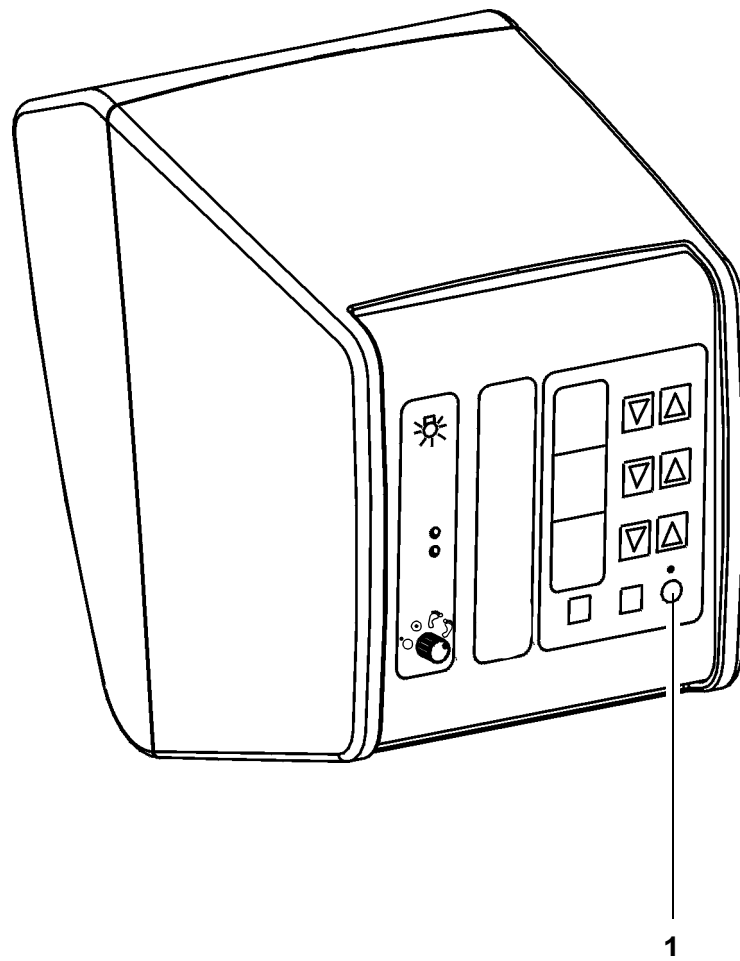
- Press Manual button (1) if brightness control is no longer possible.

Note:

When the manual function has been activated, all electrical control systems are inoperative. The lamp brightness is automatically adjusted to a fixed setting.

Failure of the focusing function

- Press Manual button (1) if, for example, the focusing system keeps moving to the upper or lower end position.
- Use the suspension arm of the suspension system for focusing.



Failure of magnetic brakes

If the magnetic brakes fail (magnetic brakes are locked), you can manually position the articulated arm including the microscope by overcoming the locking effect of the magnetic brakes.

Failure of the X-Y coupling

Failure of the X-Y coupling

Motorized control of the X-Y coupling is not possible.

- Press the Manual button.
- Manually position the surgical microscope using the movement options provided by the suspension system.

Malfunction of the X-Y coupling

The X-Y coupling performs uncontrollable movements.

- Disconnect the surgical microscope from the suspension system. The connector is located under the cover of the suspension arm. The light source remains on.

Failure of the zoom function

Failure of the zoom function

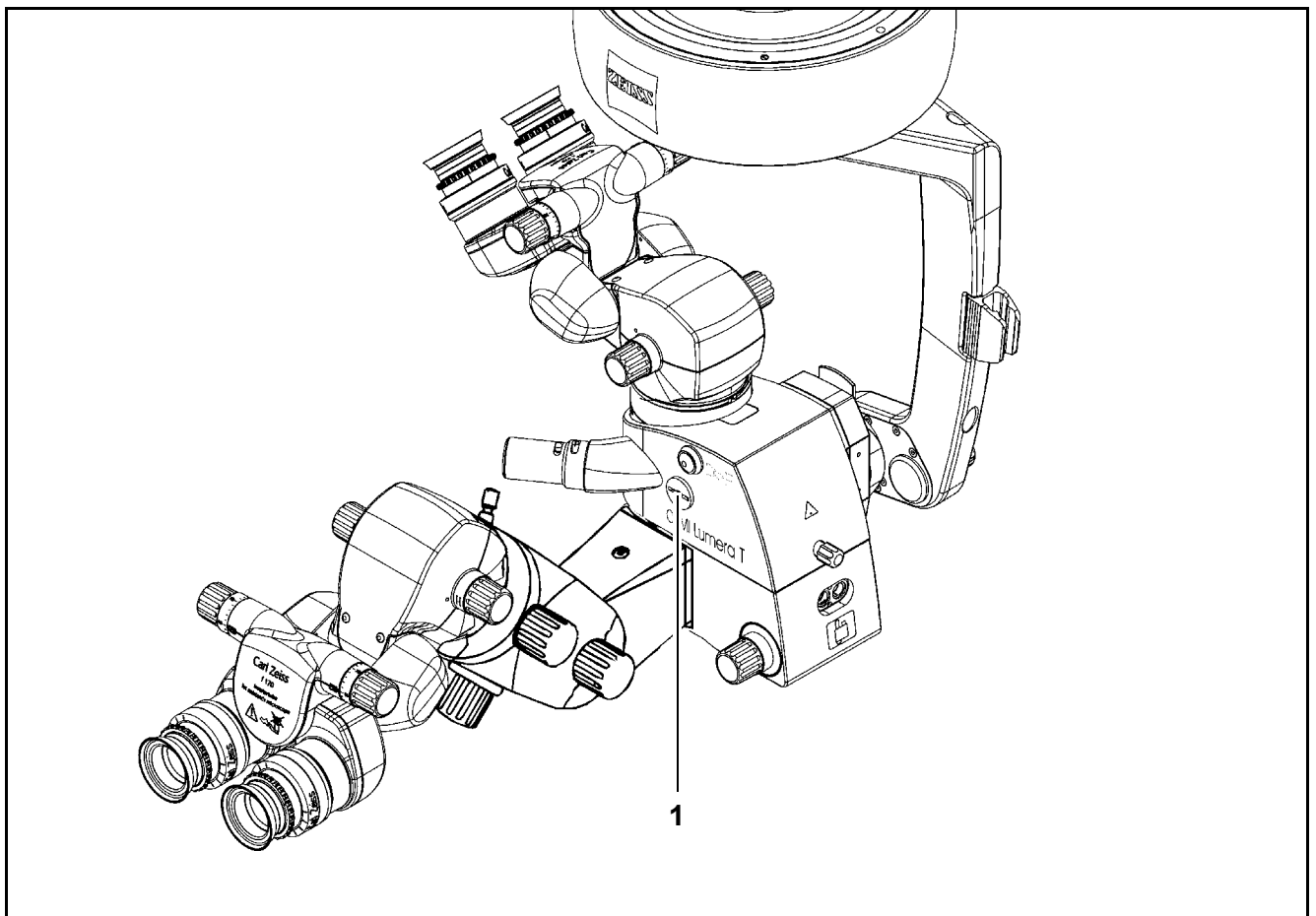
Motorized magnification adjustment is not possible.

- Press the Manual button.
- Use zoom adjustment knob (1) of the microscope to manually set the magnification required (if necessary, use a tool, e.g. a screwdriver, coin, etc.)

Malfunction of the zoom function

The zoom function performs uncontrollable settings.

- Disconnect the surgical microscope from the suspension system. The connector is located under the cover of the suspension arm. The illumination remains on.



Causes of malfunctions and remedies

For your safety

- This system is a high-grade technological product. To ensure optimum performance and safe working order, we recommend having it checked by our service representative as part of regular scheduled maintenance.

If a failure occurs which you cannot correct with the aid of the chapter "What to do in the event of malfunctions", attach a sign to the system stating it is out of order and contact our service representative.

Malfunctions in the surgical microscope

Problem	Possible cause	Remedy	See
No function at all.	Power plug of suspension system not inserted.	Plug in the power cord.	--
	Power switch of suspension system not switched on.	Press power switch. Green indicator light in power switch must be on.	page 108
	Automatic circuit breaker in power switch of suspension system has been activated.	Press power switch again.	--
	Line power failure.	Contact in-house electrician.	--
Surgical field illumination on microscope not working.	Light guide not properly inserted in microscope.	Insert light guide as far as it will go.	page 154
	Failure of suspension system electronics.	Illuminate surgical field using an OR illuminator. Contact service dept.	--
	Lamp module in suspension system has no contact.	Insert lamp module as far as it will go.	page 232

Problem	Possible cause	Remedy	See
Insufficient surgical field illumination.	Brightness level set too low.	Adjust brightness using control on suspension system or foot control panel.	--
	Defective light guide (illumination not uniform).	Contact service dept. Light guide probably needs to be changed.	--
Surgical field illumination too bright.	Brightness level set too high.	Adjust brightness using control on suspension system or foot control panel.	--
		Switch off light source on suspension system. Illuminate surgical field using an OR illuminator. Contact service dept.	--
Focusing system inoperative.	Focusing system does not work, or moves to upper or lower end position.	Use suspension arm to set correct focal plane. Contact service dept.	page 212
Zoom system inoperative.	Zoom system does not work, or moves to upper or lower end position.	Manually adjust magnification using zoom knob. Contact service dept.	page 215
Zoom and focusing systems inoperative.	Functions not correctly set on suspension system.	Contact service dept.	--
Microscope motion too stiff.	Friction adjusting knob on suspension system tightened too firmly.	Slightly loosen friction adjusting knob.	page 144
DeepView inoperative	DeepView is on mechanical end stop.	Press DeepView button to deactivate the function.	--

Malfunctions in the surgical microscope with integrated assistant's microscope


Problem	Possible cause	Remedy	See
No function at all.	Power plug of suspension system not inserted.	Plug in the power cord.	--
	Power switch of suspension system not switched on.	Press power switch. Green indicator light in power switch must be on.	page 108
	Automatic circuit breaker in power switch of suspension system has been activated.	Press power switch again.	--
	Line power failure.	Contact in-house electrician.	--
Surgical field illumination on microscope not working.	Light guide not properly inserted in microscope.	Insert light guide as far as it will go.	page 154
	Failure of suspension system electronics.	Illuminate surgical field using an OR illuminator. Contact service dept.	--
	Lamp module in suspension system has no contact.	Insert lamp module as far as it will go.	page 232
Insufficient surgical field illumination.	Brightness level set too low.	Adjust brightness using control on suspension system or foot control panel.	--
	Defective light guide (illumination not uniform).	Contact service dept. Light guide probably needs to be changed.	--
Surgical field illumination too bright.	Brightness level set too high.	Adjust brightness using control on suspension system or foot control panel.	--
		Switch off light source on suspension system. Illuminate surgical field using an OR illuminator. Contact service dept.	--
Focusing system inoperative.	Focusing system does not work, or moves to upper or lower end position.	Use suspension arm to set correct focal plane. Contact service dept.	page 212

Problem	Possible cause	Remedy	See
Zoom system inoperative.	Zoom system does not work, or moves to upper or lower end position.	Manually adjust magnification using zoom knob. Contact service dept.	page 215
Zoom and focusing systems inoperative.	Functions not correctly set on suspension system.	Contact service dept.	--
Microscope motion too stiff.	Friction adjusting knob on suspension system tightened too firmly.	Slightly loosen friction adjusting knob.	page 144
DeepView inoperative	DeepView is on mechanical end stop.	Press DeepView button to deactivate the function.	--

Malfunctions in the S8, S81 or S88 suspension system

Problem	Possible cause	Remedy	See
No function at all.	Line power failure.	Contact in-house electrician.	-
	Power switch of suspension system not switched on.	Press power switch.	-
	Automatic circuit breaker in power switch of suspension system has been activated.	Press power switch again.	-
Surgical field illumination on microscope not working.	Thermal cut-out activated.	Remove the cause of overheating. For example, drapes could be covering the grid. When the lamp module has cooled down, the light source switches on again.	-
	Selector set in such a way that illumination can be switched on using foot control panel.	Switch on illumination using foot control panel (button A or B).	-
	Failure of suspension system electronics.	Illuminate surgical field using an OR illuminator. Contact service dept.	-

Problem	Possible cause	Remedy	See
Yellow indicator lamp in display field blinks.	Defective main and backup lamps.	Change lamp or insert backup lamp module.	-
	Defective lamp module.	Illuminate surgical field using an OR illuminator. Contact service dept.	-
Insufficient surgical field illumination.	Brightness level set too low.	Adjust brightness on suspension system's display field or using foot control panel.	-
	Halogen lamp not properly plugged into lamp mount.	Properly push halogen lamp into lamp mount.	-
	Defective S light guide (illumination not uniform).	Contact service dept. Light guide probably needs to be changed.	-
Surgical field illumination too bright.	Brightness level set too high.	Adjust brightness using control on suspension system or foot control panel.	page 170
		Switch off light source on suspension system. Illuminate surgical field using an OR illuminator. Contact service dept.	-
Lamp brightness cannot be adjusted.	Manual function is activated. (Yellow LED above the button is lit).	Switch off manual function.	-
Fluorescence excitation filter cannot be swung in.	Defective fluorescence excitation filter, defective mechanism.	Use second light source, if available	-
Fluorescence excitation filter cannot be swung out.	Defective fluorescence excitation filter, defective mechanism.	Use second light source, if available	-
Motorized focusing and zoom functions of surgical microscope are inoperative.	Manual function is activated. (Yellow LED above the button is lit).	Switch off manual function.	-
Suspension arm is in horizontal position and cannot be moved upwards or downwards.	Suspension arm still locked.	Pull out locking device and turn though 180°.	-

Problem	Possible cause	Remedy	See
 XXX In combination with three successive beeps and display of the error code (XXX).	<ul style="list-style-type: none"> – Error message during the software check after power-on of the suspension system. – Error message for an internal system error. 	Manual operation is possible. Contact service dept. specify error code and serial no.	-
S88 floor stand only: stand wobbles.	Floor not level. Stand base not appropriately positioned.	Slightly turn stand base. Articulated arm should be positioned at a right angle with tilt axis.	-
Warning signal is emitted when suspension system is switched on.	Superlux Eye light source is defective.	Read chapter "Malfunction of the Superlux Eye light source". If the malfunction cannot be corrected, attach a sign to the system stating it is out of order and contact the service dept.	-
Failure of the monitor	Line power failure.	Contact in-house electrician.	-
	Failure of suspension system electronics.	Use the tube for viewing the field of view. Contact service dept.	-

Malfunctions in the video monitor

Problem	Possible cause	Remedy	See
No image display.	Main switch is switched off.	Switch on the main switch.	-
	Power cable not correctly plugged in.	Plug in the power cable.	-
Displayed message "NO SIGNAL"	No signal source connected.	Connect a signal source.	-
	No camera connected.	Connect a camera.	-
	Connected video cable is defective.	Connect an intact video cable.	-

Problem	Possible cause	Remedy	See
Image is not centered.	A signal source is present on the VGA port, and no automatic image adjustment has been performed.	Perform automatic image adjustment.	page 114
Image is too dark or too bright.	A signal source is present on the VGA port, and no automatic image adjustment has been performed.	Perform automatic image adjustment.	page 114

Malfunctions in the halogen light source

Problem	Possible cause	Remedy	See
Surgical field illumination on microscope not working.	Thermal cut-out activated.	Remove the cause of over-heating. For example, drapes could be covering the grid. When the lamp module has cooled down, the light source switches on again.	-
	Selector set in such a way that illumination can be switched on using foot control panel.	Switch on illumination using foot control panel (button A or B).	-
	Defective halogen lamp. - If yellow indicator lamp is lit, main lamp has failed. - If yellow indicator lamp blinks, backup lamp has failed.	Change lamp or insert backup lamp module.	page 232
	Ceramic base does not have proper contact with halogen lamp.	Plug ceramic base firmly onto contacts of halogen lamp.	page 232
	Lamp module has no contact.	Insert lamp module as far as it will go.	page 80
	Light guide not correctly plugged in.	Connect light guide with surgical microscope and suspension system.	page 154
	Failure of suspension system electronics.	Illuminate surgical field using an OR illuminator. Contact service dept.	-
Yellow indicator lamp in display field blinks.	Defective main and backup lamps.	Change lamp or insert backup lamp module.	page 232
Insufficient surgical field illumination.	Brightness level set too low.	Adjust brightness on suspension system's display field or using foot control panel.	
	Halogen lamp not properly plugged into lamp mount.	Properly push halogen lamp into lamp mount.	page 232

Problem	Possible cause	Remedy	See
Surgical field illumination too bright.	Brightness level set too high.	Adjust brightness using control on suspension system or foot control panel.	page 170
		Switch off light source on suspension system. Illuminate surgical field using an OR illuminator. Contact service dept.	-

Malfunctions in Superlux Eye light source

Problem	Possible cause	Remedy	See
Surgical field illumination on microscope not working.	Thermal cut-out activated.	Remove the cause of overheating. For example, drapes could be covering the grid. When the lamp module has cooled down, the illumination switches on again.	-
	Selector set in such a way that illumination can be switched on using foot control panel.	Switch on illumination using foot control panel (button A or B).	-
	Defective xenon lamp.	Switch to backup lamp.	-
		Keep a new xenon backup lamp module ready at hand.	-
	Lamp module has no contact.	Insert lamp module as far as it will go.	-
	Light guide not correctly plugged in.	Connect light guide with surgical microscope and suspension system.	page 154
	Failure of suspension system electronics.	Illuminate surgical field using an OR illuminator. Contact service dept.	-

Problem	Possible cause	Remedy	See
Insufficient surgical field illumination.	Brightness level set too low.	Adjust brightness on suspension system's display field or using foot control panel.	
	Aged xenon lamp.	Switch off illumination on suspension system. Illuminate surgical field using an OR illuminator. Change xenon lamp.	
Surgical field illumination too bright.	Brightness level set too high.	Adjust brightness using control on suspension system or foot control panel.	page 170
		Switch off illumination on suspension system. Illuminate surgical field using an OR illuminator. Contact service dept.	-
No surgical field illumination.	Xenon lamp does not ignite.	Switch off illumination on suspension system. Illuminate surgical field using an OR illuminator. Contact service dept.	--
Xenon lamp is lit, but beep sounds intermittently.	Defective lamp control system.	Switch off illumination on suspension system. Illuminate surgical field using an OR illuminator. Contact service dept.	--
Surgical field illumination on microscope not working.	Thermal cut-out activated.	Remove the cause of overheating. For example, drapes could be covering the grid. When the lamp module has cooled down, the illumination switches on again.	-

Care and maintenance

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Care of the unit



Warning!

If possible, the systems and accessories should be cleaned immediately after use. Contaminations should not be allowed to dry on the objects, as this would make cleaning and disinfecting more difficult.

If possible, machines should be used for disinfecting and cleaning. For details, please also see the relevant notes on sterilization equipment.

Cleaning optical surfaces

The multi-layer T* coating of the optical components (e.g. eyepieces, objective lenses) ensures optimum image quality.

Image quality is impaired by even slight contamination. To protect the internal optics from dust, the system should never be left without the objective lens, binocular tube and eyepieces. After use, cover the system to protect it from dust. Always store optical components and accessories in dust-free cases when they are not being used.

Clean the external surfaces of optical components as required:



Caution:

Do not use any chemical detergents or aggressive substances. These may damage the optical surfaces.

- Remove coarse dirt (splashes of blood etc.) using distilled water to which a dash of household dish-washing liquid has been added. Wipe the surfaces only with a damp, under no circumstances with a wet cloth.
Any remaining marks can be easily removed using the following aids.
- For thorough cleaning of optical surfaces, use the optics cleaning set (Cat. No. 1216-071) or damp optics cleaning wipes (available from specialized dealers).
- Remove minor contaminations such as dust, streaks, etc. using a clean microfiber cleaning cloth (available from specialized dealers or under Cat.No. 1254-655).

Auxiliaries from Zeiss: **optics cleaning set, Cat. No. 1216-071**

Suitable for the cleaning of objective lenses and eyepieces of the surgical microscope at regular intervals.

Fogging of optical surfaces

To protect the eyepiece optics from fogging, we recommend using an anti-fogging agent.



Note:

Anti-fogging agents provided by eyecare professionals for use with eye-glass lenses are also suitable for Zeiss eyepieces.

- Please observe the instructions for use supplied with each anti-fogging agent.

Anti-fogging agents do not only ensure fog-free optics. They also clean the eyepiece optics and protect them against dirt, grease, dust, fluff and fingerprints.

Cleaning mechanical surfaces

All mechanical surfaces of the equipment can be cleaned by wiping with a moist cloth. Do not use any aggressive or abrasive cleaning agents.

Wipe off any residue with a mixture of 50% ethyl alcohol and 50% distilled water plus a dash of household dish-washing liquid.

Sterilization

The asepsis sets available from Carl Zeiss contain rubber caps, sleeves and handgrips which can be sterilized in autoclaves. For detailed information on sterilization please see the instructions "Preparation of resterilizable products" enclosed with each product.

Sterile single-use drapes are available to cover the system.



Note:

When draping the system, make sure there is enough slack in the drapes to allow for movement of the microscope carrier and surgical microscope. It is especially important that the drapes are completely loose around the handgrips. The surgeon must be able to operate the controls through the drape.

Disinfecting the control keys

To be able to use the system in the OR, for example, it may be necessary to disinfect the control keys. We recommend using MELISEPTOL disinfectant from B. Braun, Melsungen AG. MELISEPTOL is available from Carl Zeiss, and you can also obtain it locally in many countries from representatives of B. Braun, Melsungen AG.



Warning:

- Use MELISEPTOL in accordance with the manufacturer's specifications and observe the instructions for use provided with the product.
- Wear disposable plastic gloves to prevent skin contact with the disinfectant.
- MELISEPTOL is flammable (flame point at 31 °C). Please read the product information from B. Braun, Melsungen AG.

The following items can be ordered from Carl Zeiss:

	Cat. No.
1 l MELISEPTOL in vario bottle	INR 0103.907
MELISEPTOL HBV spray, 250 ml	INR 0103.910
MELISEPTOL HBV cloths	INR 0103.911

Disposable plastic gloves:

Size 1 (large) size 8-9	INR 0117.736
Size 2 (medium) size 7-8	INR 0117.737

Changing the halogen lamp



Warning!

If you change the lamp shortly after it has failed, the lamp will still be very hot. Wear heat-protection gloves to avoid burns!

To change the lamp, proceed as follows:

- Switch off the light source via knob (3) and the system at its power switch.
- Press button (2), the lamp module is slightly ejected. Pull out lamp module (1).
- Remove the defective halogen lamp from the spring-loaded mount.
- Pull ceramic base (8) from the contact pins of the halogen lamp.



Note:

If both halogen lamps (4 and 5) fail during surgery, insert a backup lamp module provided ready at hand. For this reason, always make sure before surgery that the halogen lamps in the backup lamp module are intact.

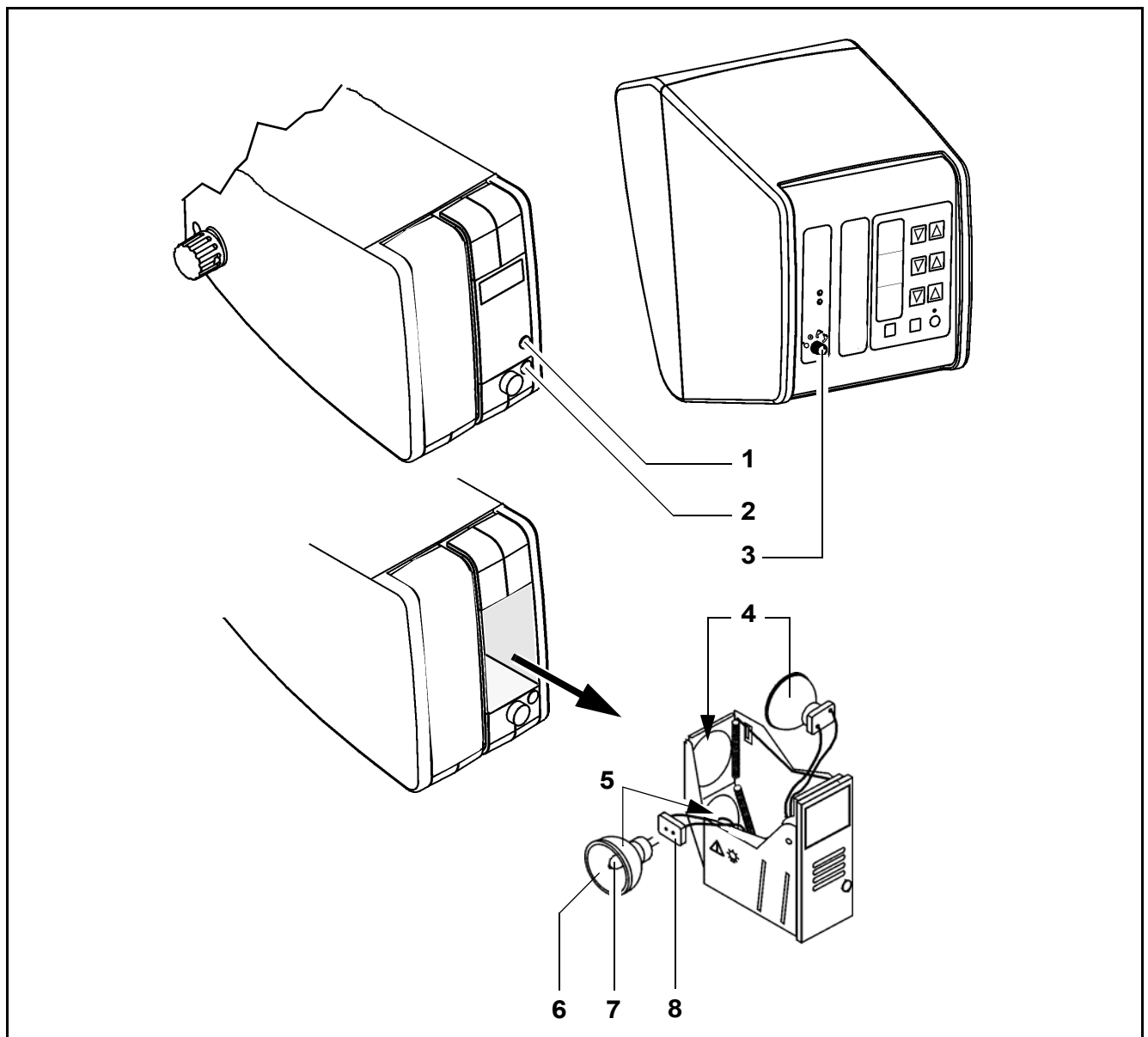
- Plug ceramic base (8) onto the contact pins of the new halogen lamp.
- Insert the new halogen lamp. Make sure you do not touch lamp bulb (7) or the interior of reflector (6).
- Press the halogen lamp into the spring-loaded mount.
- Push the lamp module including the new halogen lamp back into the system.
- Turn on the system at the power switch and the light source at the knobs.



Note:

- Only use 12 V, 100 W halogen lamps available under the specified Cat. No. Cat. No.: 38 00 79-9040

To use the service life of your halogen lamps as economically as possible, we recommend that you proceed as follows: If main lamp (4) has failed, remove it and replace it by backup lamp (5). Install the new halogen lamp instead of the backup lamp.



Changing the Superlux Eye xenon lamp module



Warning!

Lamp rupture (audible as a loud bang) may lead to jamming of the lamp module and/or failure of the electronics modules.

- Before opening the lamp housing, make sure that the system is moved to a position where neither the patient nor the user is put at risk by falling items.
- Do not continue using the system if the lamp module is jammed or the illumination is no longer operational due to defective electronics modules. Inform our service department.



Warning!

The lamp module must only be changed by appropriately trained personnel.

Improper handling of the xenon lamp may lead to damage or injury. Please observe the following points:

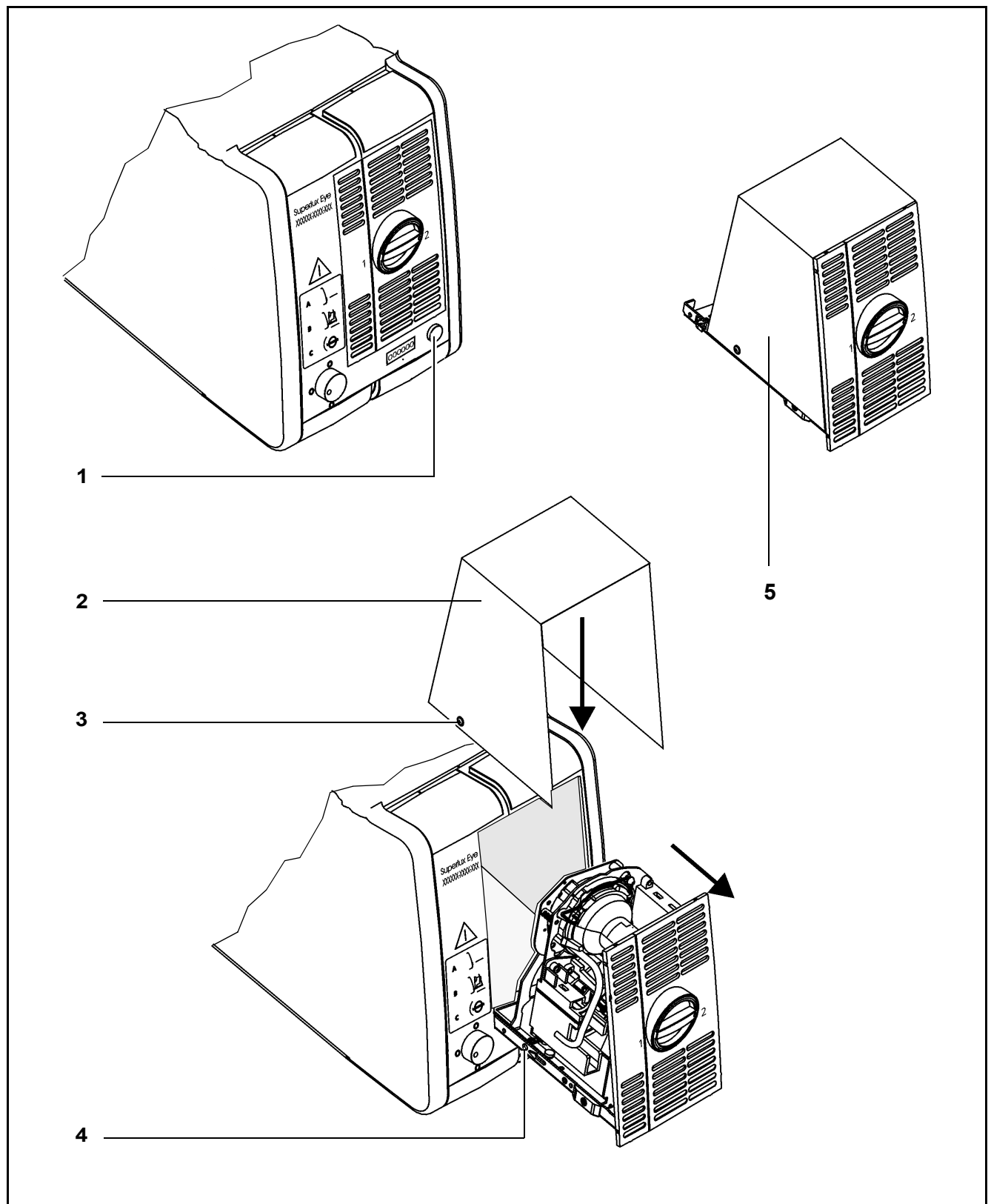
- First switch off the suspension system at the power switch.
- Only change the lamp module after it has cooled down completely! In the event of a malfunction, there is a risk of explosion due to the high pressure inside the hot lamp. The hot surface of the xenon lamp may also cause burns.
- Press button (1). The lamp module is slightly ejected.
- Pull out the lamp module as far as it will go.
- Slide the original transport case (2) over the module, making sure that bolt (3) engages in bore (4). This unlocks the stop.
- Remove the old module and install the new lamp module by proceeding in the reverse order.
- Check the function of the xenon lamp and backup xenon lamp.

Pack the old lamp module (5) in the transport package of the new lamp module. Fill in the enclosed return card and send the old lamp module to the nearest Carl Zeiss service agency.



Note:

- Only use the original transport case (2) as it also provides explosion protection, should xenon lamps be defective.



Balancing the monitor arm

If the TFT monitor does not remain in place in every position required, the following readjustments can be performed.

Increasing the friction of left/right movement of the carrier arm

- Slightly tighten screw (1) of the monitor carrier arm by turning it clockwise using an M5 hex key.

Increasing the friction of left/right movement of the suspension arm

- Remove plastic cover (2) on the suspension arm joint.
- Loosen securing screw (4) on the carrier arm by turning it counter-clockwise using an M2.5 hex key.
- Tighten adjustment screw (3) of the suspension arm by turning it clockwise until the required friction has been obtained.
- Firmly retighten securing screw (4) on the carrier arm by turning it clockwise using an M2.5 hex key.
- Reattach plastic cover (2).

Readjusting the gas pressure spring

- For correct adjustment of the gas pressure spring, align the carrier and suspension arms in a horizontal position.
- Tighten setting screw (5) of the gas pressure spring by turning it **counterclockwise** with an M5 hex key until the suspension arm with the TFT monitor no longer moves downward by itself.



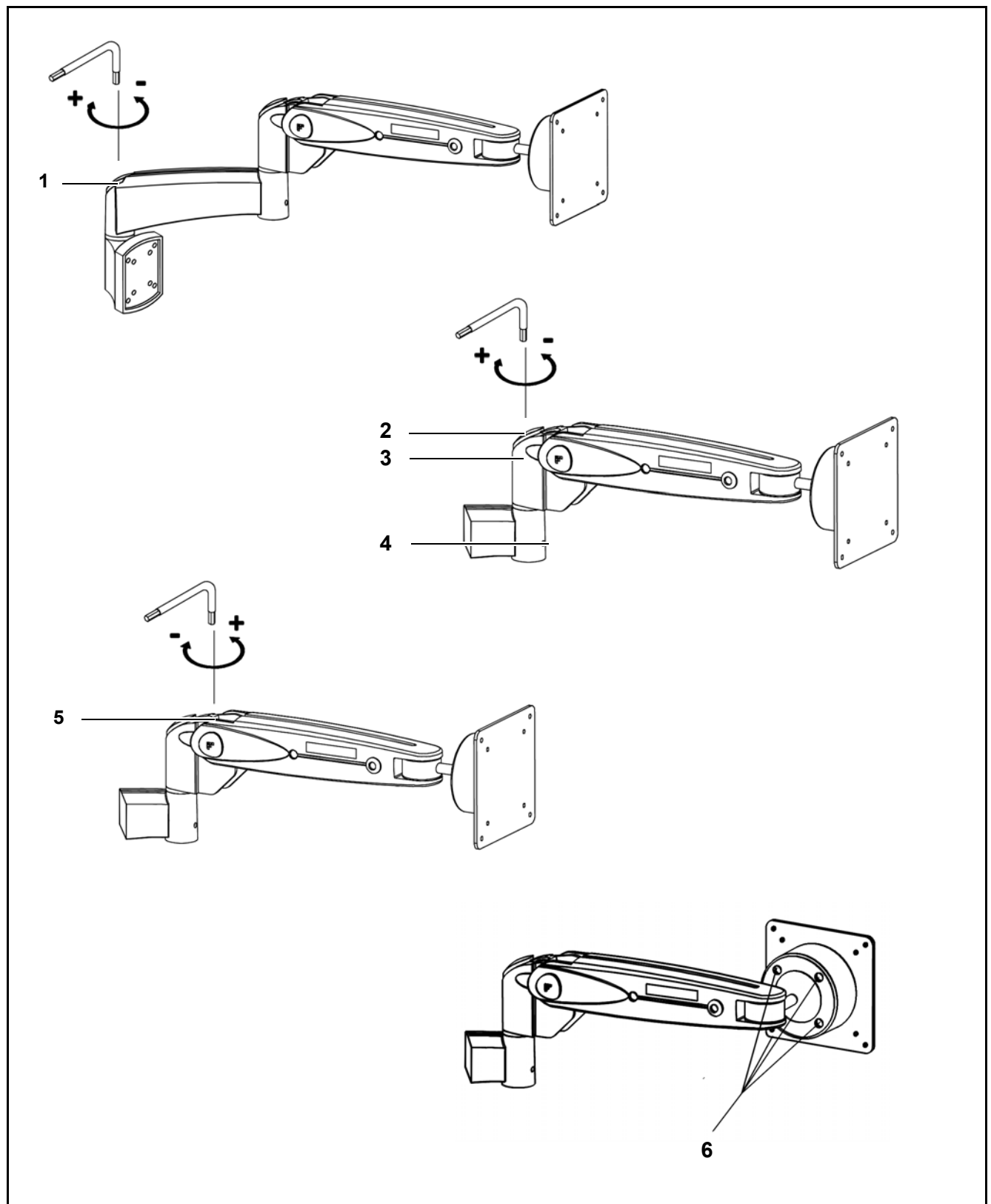
Note:

If the suspension arm with the TFT monitor continues to move downward, the gas pressure spring is defective.

- Please contact our service department in this case.

Adjusting the friction of the TFT monitor's movement at the ball joint

- Tighten all of the four securing screws (6) of the ball joint by turning them clockwise until the TFT monitor remains in the required position.



System data

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Technical data

Lumera T surgical microscope with integrated assistant's microscope

Optics

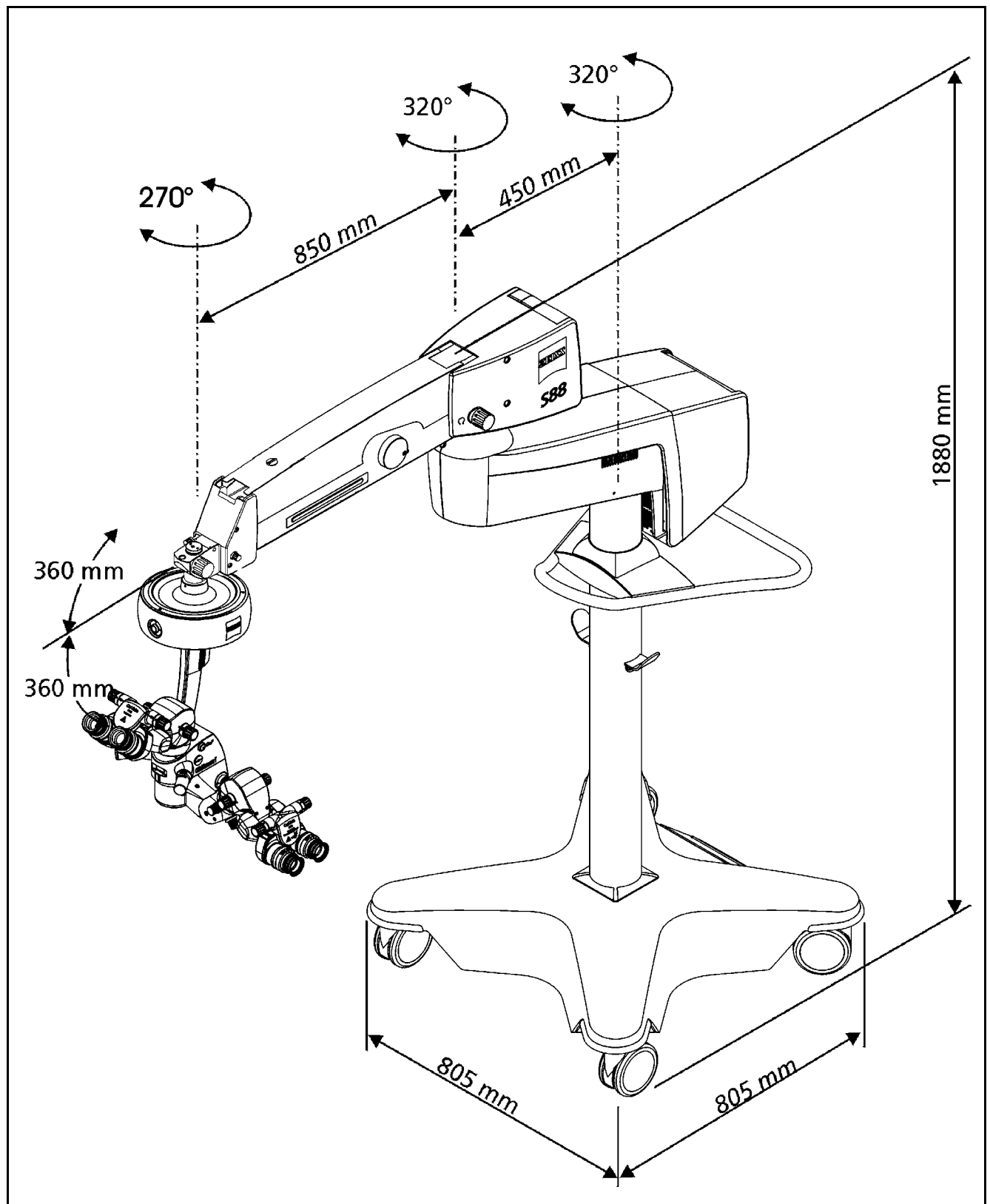
Magnification	<u>Main microscope</u> 3.5x - 21.0x at working distance of 200 mm and with 10x eyepieces Motorized zoom system with apochromatic optics, 1:6 zoom ratio, Magnification factor $\gamma = 0.4x - 2.4x$
Focusing	Motorized, focusing range 50 mm At the press of a button, the focusing drive moves to the starting position of the focusing range.
Objective lens focal length	f = 200 mm (option: f = 175 mm)
Tubes / Eyepieces	<u>Main microscope</u> 180° tiltable binocular tube, f = 180 mm 12.5x widefield eyepieces (option: 10x) with magnetic coupling. <u>Integrated assistant's microscope</u> 5-step magnification changer, separate fine focusing system, adjustable tilt. Binocular tube, rotatable by $\pm 12^\circ$ about the optical axis, 10x widefield eyepieces with magnetic coupling
Illumination	Light guide socket for fiber optic illumination, optionally halogen or Superlux Eye (xenon) Filter against UV exposure Protection against IR exposure
Swing-in stops	Patented retinal protection device Pat. No. DE 33 39 17 2 C2

Mechanical data



Front-to-back tilt of microscope	With self-locking gear drive, manually adjustable using a knob. Tilt angle $\pm 90^\circ$
X-Y coupling	Adjustment range: max. 40 mm x 40 mm Automatic centering at the press of a button
Weight with coobservation tube	Approx. 13.7 kg (with tube, objective lens and eyepieces)
Weight without coobservation tube	Approx. 10.2 kg (with tube, objective lens and eyepieces)

S88 floor standMechanical data

Suspension arm	Length...850 mm Swivel angle...320° Vertical lift...± 360 mm
Carrier arm	Length...450 mm Swivel angle...320°
Stand height	1880 mm
Base	805 x 805 mm (length x width)
Admissible max. load on suspension arm	20 kg (complete microscope equipment, including accessories)
Total weight	approx. 215 kg

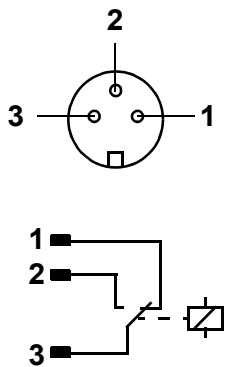


Electrical data of S88 floor stand

Power requirements	Only connect the suspension system to wall outlets which are provided with a properly connected protective ground conductor.
Rated voltage	115 VAC (100...125 VAC± 10%) 230 VAC (220...240 VAC± 10%)
Current consumption	115 VAC max.10 A 230 VAC max. 8 A
Rated frequency	50...60 Hz
Fuses	Automatic circuit breaker
Electrical outlets	Power outlet 115/230 VAC, max. 5 A Power outlet 115/230 VAC, max. 2 A (Via power switch) X-Y coupling Surgical microscope Remote control socket for an external signal of a maximum of 24 V / 0.5 A.
Electrical standard	Complying with IEC 60601-1/ EN 60601-1; UL 60601-1; CAN/CSA-C22.2 No. 601.1-M90 Protection class I, degree of protection IPX0 Type B equipment  Product classification I as per directive 93/42/EEC, Annex IX
Approval	 176164 C US
EMC requirements	The system meets the EMC requirements of IEC 60601-1-2. The system meets the RFI requirements of Class A (hospital grade).

Remote socket

View of connector side



The system has been designed for continuous operation.

Halogen light source

Fiber-optic illumination system

Lamp housing with 2 halogen reflector lamps (1 backup lamp) with 12 V 100 W in quick-change modules for one light guide,

with blue barrier filter (retina protection filter) and KK40 filter (to increase the color temperature),

fully automatic lamp change when the first halogen lamp fails.

Superlux Eye light source

Fiber-optic illumination system

Xenon short-arc reflector lamp,
Color temperature: approx. 5000 K

Rated power: approx. 180 W

Blue barrier filter (retina protection filter), HaMode filter or fluorescence excitation filter

Backup lamp in lamp housing, manually selectable.

Video monitor

LCD display	TFT color monitor
Screen size	15"
Resolution	1024 x 768
Reaction time	25 ms
Brightness	200 cd/m ²
Contrast ratio	200:1
Display colors	16.7 million
Sampling rate	Horizontal: 30 - 80 KHz, vertical: 50 - 75 Hz
Viewing angles	Horizontal: 178°, vertical: 178°
Video input ports	DVI, VGA, S-Video, cVBS (Video), Component
Power input	24 VDC ± 20%
Power consumption	28W
Weight	3.2 kg
Dimensions (H x W x D)	286 x 348 x 51 mm

S-Video mode, Composite mode

Resolution	Refresh rate (HZ)	Description
640 x 480	50	-
640 x 480	60	NTSC
720 x 576	50	PAL
720 x 576	60	-

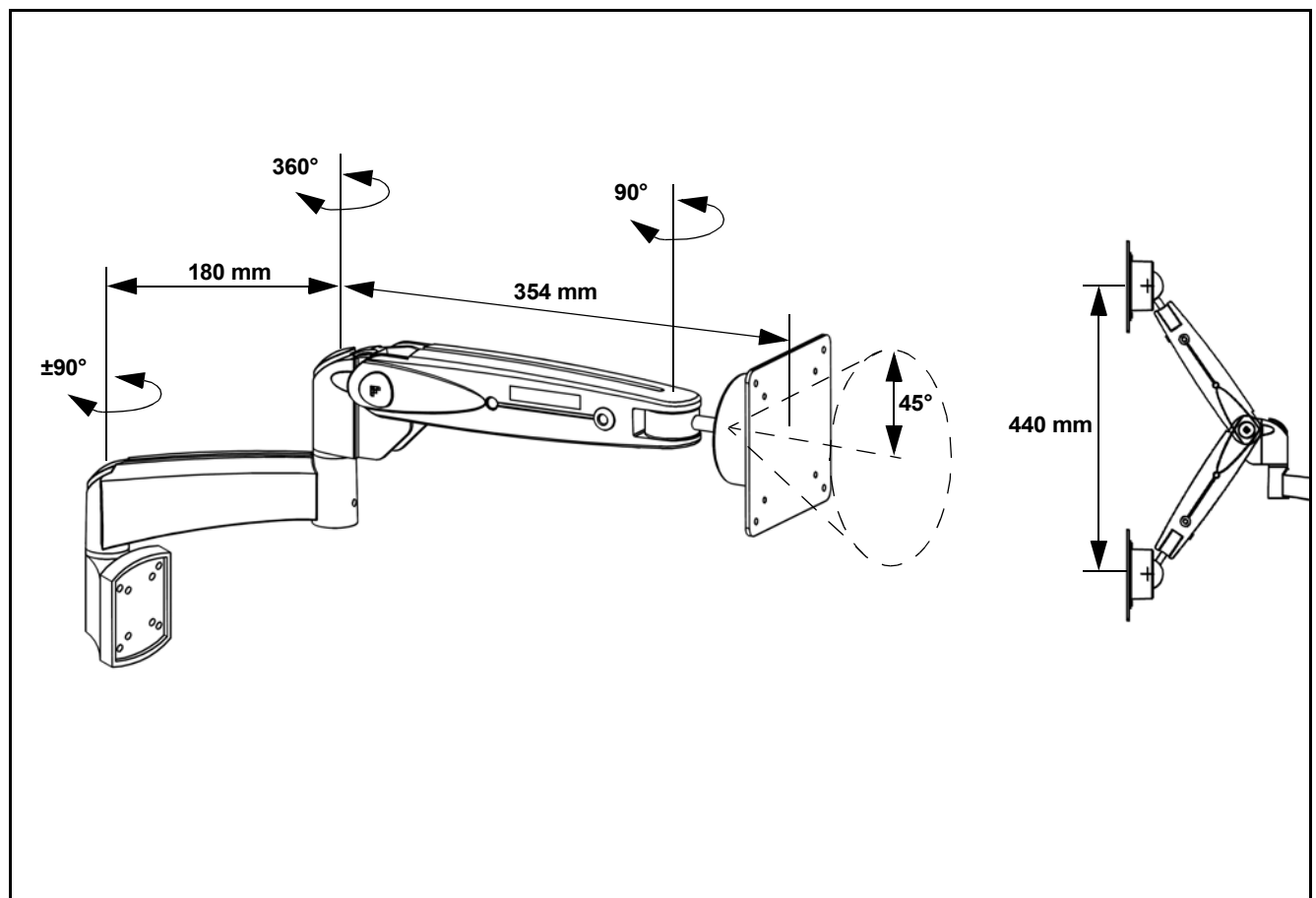
DVI mode, VGA mode, Component mode

Resolution	Refresh rate (HZ)	Description
640 x 480	50	-
640 x 480	60	-
720 x 576	50	-
720 x 576	60	-
800 x 600	50	-
800 x 600	60	VESA
800 x 600	70	VESA
800 x 600	75	VESA
1024 x 768	50	-
1024 x 768	60	VESA
1024 x 768	70	VESA
1024 x 768	75	VESA

Monitor arm

Mechanical data

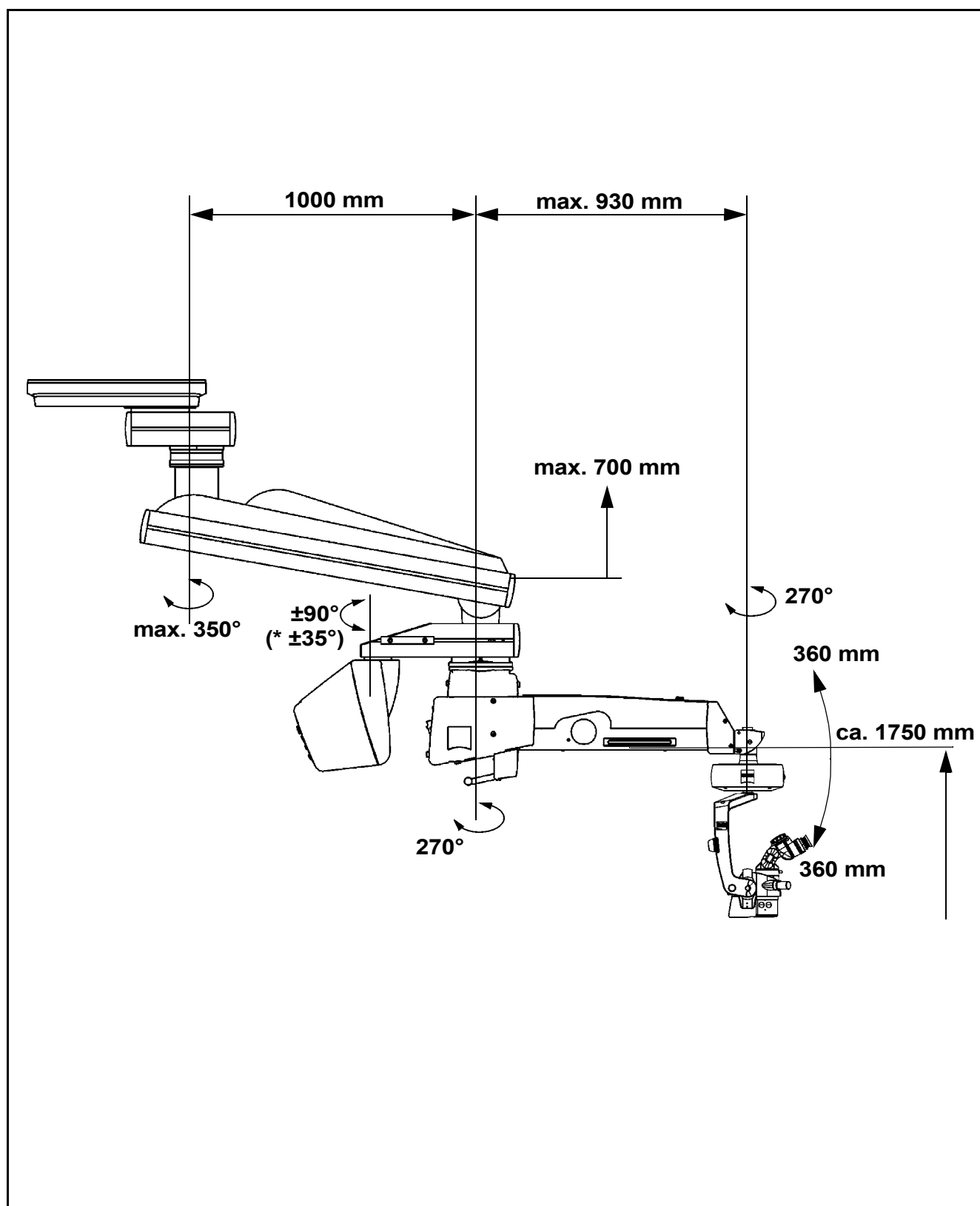
Suspension arm:	Length...354 mm
	Swivel angle...360°
	Vertical lift...± 220 mm
Carrier arm	Length...180 mm
	Swivel angle...± 90°
Admissible max. load on the monitor arm	9.0 kg
Total weight	Approx. 4.13 kg





S8 ceiling mount

Mechanical data

Suspension arm	Length...930 mm Swivel angle...270° Vertical lift...± 360 mm Swivel angle of control panel...180° (± 90°) * Superlux Eye light source with integrated halogen light source (option) Swivel angle of control panel...± 35°
Lift and carrier arms	Length...1000 mm Swivel angle...270°
Recommended working height	Approx. 1750 mm (on grip)
Admissible max. load on suspension arm	20 kg (complete microscope equipment, including accessories)
Weight of ceiling mount	Approx. 200 kg



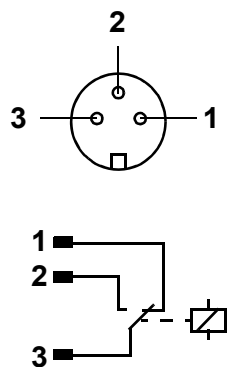
Electrical data of S8 ceiling mount

Rated voltage	230 VAC (220...240 VAC± 10%) 115 VAC (100...125 VAC± 10%)
Current consumption	230 VAC 3 A 120 VAC 5 A 100 VAC 6 A
Rated frequency	50...60 Hz
Fuses	Automatic circuit breaker
Electrical outlets	<ul style="list-style-type: none">– X-Y coupling– Surgical microscope– Remote control socket for an external signal of a maximum of 24 V / 0.5 A.
Electrical standard	Complying with IEC 60601-1/ EN 60601-1; UL 60601-1; CAN/CSA-C22.2 No. 601.1-M90 Protection class I, degree of protection IPX0 Type B equipment  Product classification I as per directive 93/42/EEC, Annex IX
Approval	
EMC requirements	The system meets the EMC requirements of IEC 60601-1-2. The system meets the RFI requirements of Class A (hospital grade).

The system has been designed for continuous operation.

Remote socket

View of connector side



Halogen light source

Fiber-optic illumination system

Lamp housing with 2 halogen reflector lamps (1 backup lamp) with 12 V 100 W in quick-change modules for one light guide,

with blue barrier filter (retina protection filter) and KK40 filter (to increase the color temperature),

fully automatic lamp change when the first halogen lamp fails.

Superlux Eye light source

Fiber-optic illumination system

Xenon short-arc reflector lamp,
Color temperature: approx. 5000 K

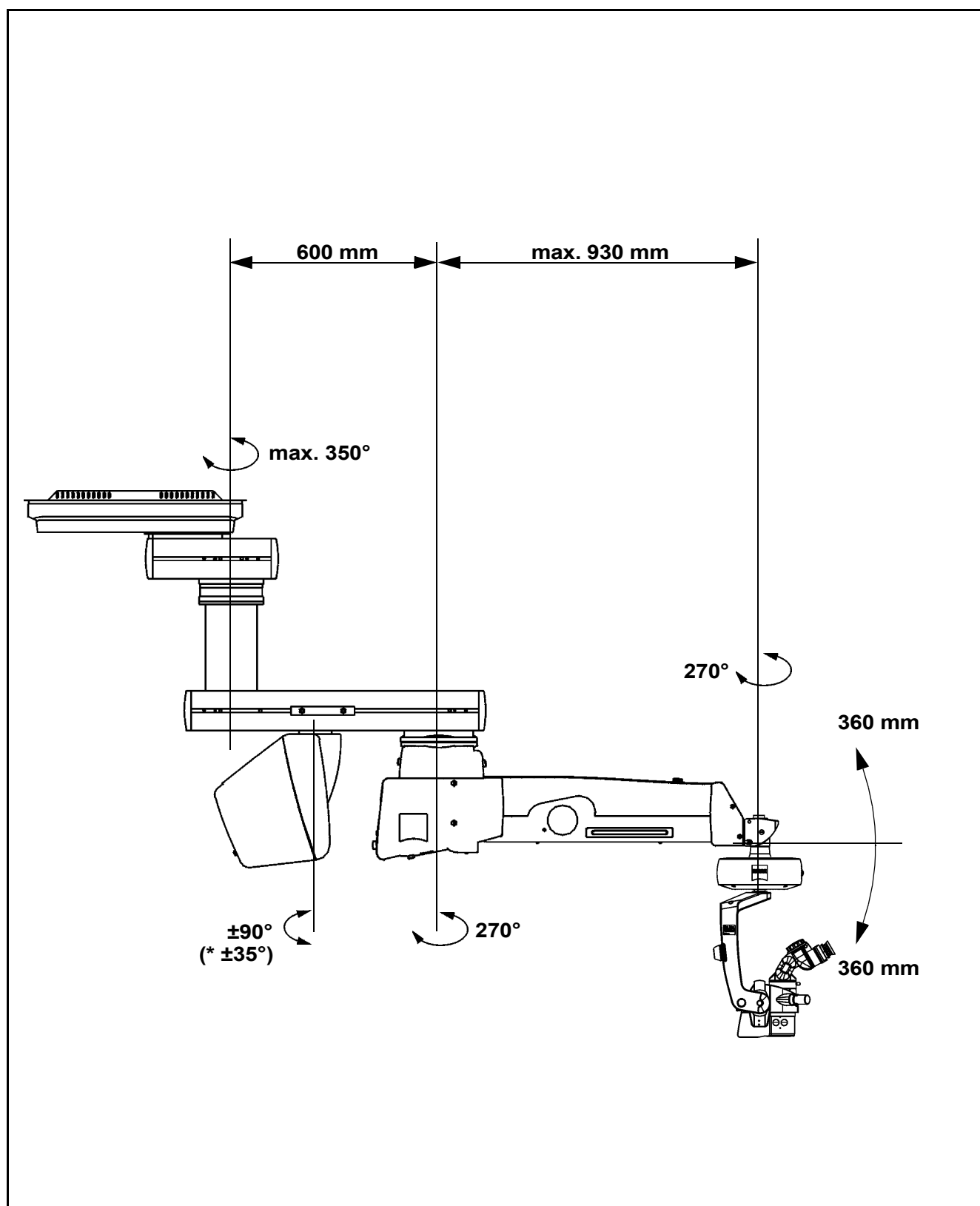
Rated power: approx. 180 W

Blue barrier filter (retina protection filter), HaMode filter or fluorescence excitation filter



Backup lamp in lamp housing, manually selectable.

S81 ceiling mountMechanical data

Suspension arm	Length...930 mm Swivel angle...270° Vertical lift...± 360 mm Swivel angle of control panel...180° (± 90°) * Superlux Eye light source with integrated halogen light source (option) Swivel angle of control panel...± 35°
Carrier arm	Length...600 mm Swivel angle...270°
Recommended working height	Approx. 1750 mm
Admissible max. load on suspension arm	20 kg (complete microscope equipment, including accessories)
Weight of ceiling mount	Approx. 178 kg



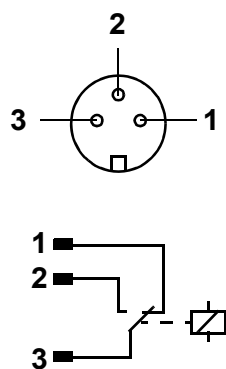
Electrical data of S81 ceiling mount

Rated voltage	230 VAC (220...240 VAC± 10%) 115 VAC (100...125 VAC± 10%)
Current consumption	230 VAC 3 A 120 VAC 5 A 100 VAC 6 A
Rated frequency	50...60 Hz
Fuses	Automatic circuit breaker
Electrical outlets	<ul style="list-style-type: none">– X-Y coupling– Surgical microscope– Remote control socket for an external signal of a maximum of 24 V / 0.5 A.
Electrical standard	Complying with IEC 60601-1/ EN 60601-1; UL 60601-1; CAN/CSA-C22.2 No. 601.1-M90 Protection class I, degree of protection IPXO Type B equipment  Product classification I as per directive 93/42/EEC, Annex IX
Approval	 176164 C US
EMC requirements	The system meets the EMC requirements of IEC 60601-1-2. The system meets the RFI requirements of Class A (hospital grade).

The system has been designed for continuous operation.

Remote socket

View of connector side



Halogen light source

Fiber-optic illumination system

Lamp housing with 2 halogen reflector lamps (1 backup lamp) with 12 V 100 W in quick-change modules for one light guide,

with blue barrier filter (retina protection filter) and KK40 filter (to increase the color temperature),

fully automatic lamp change when the first halogen lamp fails.

Superlux Eye light source

Fiber-optic illumination system

Xenon short-arc reflector lamp,
Color temperature: approx. 5000 K

Rated power: approx. 180 W

Blue barrier filter (retina protection filter), HaMode filter or fluorescence excitation filter

Backup lamp in lamp housing, manually selectable.

Magnifications / Fields of view

Using the magnification factor γ of the zoom system, you can calculate the total magnification of the surgical microscope according to the following formula:

$$M_T = \frac{f_{\text{tube}}}{f_{\text{obj}}} \cdot \gamma \cdot M_{\text{eye}}$$

where:

f_{tube} is the focal length of the binocular tube

f_{obj} is the focal length of the main objective lens

γ is the magnification factor set on the zoom system

M_{eye} is the magnification of the eyepiece

Example:

$f_{\text{tube}} = 170 \text{ mm}$, $f_{\text{obj}} = 200 \text{ mm}$, $\gamma = 1.6$ and $M_{\text{eye}} = 12.5 \times$.

The resulting total magnification is:

$$M_T = \frac{170 \text{ mm}}{200 \text{ mm}} \cdot 1.6 \cdot 12.5 = 17.0$$

If the total magnification M_T of the surgical microscope is known, the field-of-view diameter FoV_D can be calculated using the formula:

$$\text{FoV}_D = \frac{\text{FoV}_N \cdot M_{\text{eye}}}{M_T}$$

The field-of-view diameter FoV_D is the diameter of the circular area of the surgical field which can be seen through the eyepieces.

FoV_N in the above formula stands for the field-of-view number of the eyepiece. This number is marked on our widefield eyepieces.

Using $M_T = 17.0$ from the example above, the field-of-view diameter obtained with a 12.5x eyepiece with a field-of-view number FoV_N of 18 mm is calculated as follows:

$$\text{FoV}_D = \frac{18 \text{ mm} \cdot 12.5}{17.0} = 13.2 \text{ mm}$$

Ordering data

Please observe the following:

Only operate the instrument with the accessories included in the delivery package. If you want to use other accessories, make sure that Carl Zeiss or the manufacturer of the accessories has proved and confirmed that these accessories meet the respective technical safety standards and can be used without risk.

Accessories for Lumera T surgical microscope

Description	Cat. No.
Invertertube	303797-9120-000
Invertertube for assistant's microscope	303797-9130-000
45° inclined tube (option)	303784-0000-000
180° tiltable binocular tube (option)	303791-0000-000
10x eyepieces (2 units)	305542-0000-000
12.5x eyepieces (2 units) (option)	305543-9901-000
Objective lens, f = 200 mm	302652-9904-000
Objective lens, f = 200 mm with carrier ring (option)	302672-9904-000
Objective lens, f = 175 mm (option)	302651-9902-000
Objective lens, f = 175 mm with carrier ring (option)	302671-9902-000
Dust cover	000000-1055-278
Optical wedge (option)	000000-1006-145

Halogen light source and accessories

Description	Cat. No.
Halogen light source, 1x	000000-1174-210
Halogen light source, 2x	000000-1174-211
485 nm fluorescence excitation filter for halogen	000000-1116-539
12 V, 100 W halogen lamp	380079-9040-000

Superlux Eye light source and accessories

Description	Cat. No.
Superlux Eye light source with blue barrier filter (retina protection filter), HaMode filter and light guide	304977-9011-000
– Front panel with HaMode filter	304977-9011-500
– Front panel with 485 nm fluorescence excitation filter	304977-9012-500
– 485 nm fluorescence excitation filter for xenon	304877-8010-000
– Complete xenon lamp module with 2 xenon lamps in transport container and with return card (in exchange for a returned xenon lamp module with defective xenon lamps)	304977-9036-700
– Complete xenon lamp module with 2 xenon lamps for Superlux Eye (new component)	304977-9036-000
Upgrade kit for retrofitting an existing Superlux Eye light source with an additional integrated halogen light source (option) on ceiling mounts	304977-9022-000
Upgrade kit for retrofitting an existing Superlux Eye light source with an additional integrated halogen light source (option) on floor stands	304977-9020-000

Additional light guide for dual illumination

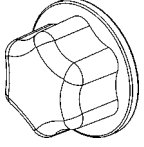
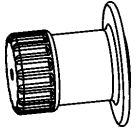
Description	Cat. No.
S light guide, 2.0 m	303481-9020-000
S light guide, 2.2 m	303481-9022-000

Further accessories

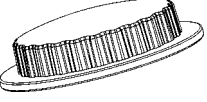
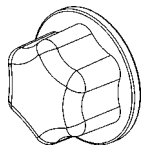
Description	Cat. No.
OPMI Lumera light guide, 2.0 m	000000-1444-818
Foot control panel 2 with 14 functions, 6m cable	304979-9020-000
15" TFT monitor with arm and instrument tray for S88 floor stand	305953-9030-000

Spare parts

Asepsis sets for Lumera T surgical microscope

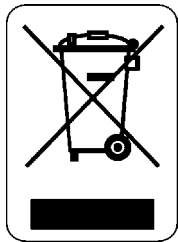
	Description	Cat. No.
	Sterilizable caps for knobs, internal diameter 22 mm (pack of 6)	305810-9001-000
	Sterilizable caps for handgrips, (pack of 6)	305810-9010-000

Asepsis sets for tubes

	Description	Cat. No.
	For 180° tiltable tube: Sterilizable cap for PD adjustment knob, internal diameter 51 mm (pack of 6)	305810-9003-000
	For 45° tiltable tube: Sterilizable cap for PD adjustment knob, internal diameter 22 mm (pack of 6)	305810-9001-000

Disposal

User information on the disposal of electrical and electronic devices



This symbol means that the product must not be disposed of as normal domestic waste.

The correct disposal of electrical or electronic devices helps to protect the environment and to prevent potential hazards to the environment and/or human health which may occur as a result of improper handling of the devices concerned.

For detailed information on the disposal of the product, please contact your local dealer or the device manufacturer or its legal successor. Please also note the manufacturer's topical information on the internet. In the event of resale of the product or its components, the seller is required to inform the buyer that the product must be disposed of in accordance with the applicable national regulations currently in force.

For end customers in the European Union

Please contact your dealer or supplier if you wish to dispose of electrical or electronic devices.

Information on disposal in countries outside the European Union

This symbol is only applicable in the European Union. For the disposal of electrical and electronic devices, please observe the relevant national legislation and other regulations applicable in your country.

Ambient requirements

For operation	Temperature Rel. humidity Air pressure	+10 °C...+40 °C 30%...75% 700 hPa...1,060 hPa
For transportation and storage	Temperature Rel. humidity (without condensation) Air pressure	- 40 °C...+70 °C 10%...100% 500 hPa...1,060 hPa

CE conformity

The system meets the essential requirements stipulated in Annex I to the 93/42/EEC Directive governing Medical Devices. The system is labeled with:



Changes to the system

Subject to changes in design and scope of delivery as a result of ongoing technical development.

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